

SCIENCE

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NATIONAL ACADEMIES AND THE PROGRESS OF RESEARCH¹

II. THE FIRST HALF CENTURY OF THE NATIONAL ACADEMY OF SCIENCES

IN the days preceding the American Revolution, the Royal Society was to this country what it still is to the existing British Colonies: the central and authoritative representative of scientific research.² Americans eminent for their contributions to science were elected Fellows, and their papers appeared in the *Philosophical Transactions*. The list of colonial Fellows includes Cotton Mather, Bowdoin, Dudley, and the three Winthrops in New England; Franklin, Rittenhouse and Morgan in Pennsylvania; Banister, Clayton, Mitchell and Bird, in Virginia, and Garden and Williamson in the Carolinas. But so distant a body could not meet all local needs. Thus Franklin, active in every field, undertook the organization of the American Philosophical Society in 1743, some years before its time, as its early demise proved. In 1766 the American Society held at Philadelphia for Promoting Useful Knowledge was established and Franklin, then in Europe, was elected its first president. In the meantime the earlier society was revived, and

¹ For most of the material in the following pages the writer is indebted to a history of the "First Half Century of the National Academy of Sciences," prepared and edited by Frederick W. True in connection with the recent celebration of the fiftieth anniversary of the founding of the academy.

² See an excellent article by G. Browne Goode, from which the data used in the introduction of the present paper are taken: "The Origin of the National Scientific and Educational Institutions of the United States," Annual Report of the American Historical Association for 1889.

the amalgamation of the two in 1769 gave rise to a scientific body which has always exercised a powerful and beneficent influence on the progress of science in the United States. The prominence in the affairs of state of its leading members is illustrated in the frequent interruptions to the proceedings of the society between 1773 and 1779, when these men, who included Washington, Franklin, Jefferson and Adams, were occupied with the labors of organizing the new republic. The American Philosophical Society, modelled after the Royal Society, but embracing the whole field of knowledge, soon assumed great importance at its seat in Philadelphia, then the center of American scientific and literary life.

John Adams, when representing the United States in France, learned of the appreciation in which the Philosophical Society was held in academic circles. On his return to Boston in 1779 he suggested the establishment of the American Academy of Arts and Sciences, which was duly incorporated by act of the Massachusetts State Legislature in 1780. At this time the influence of France was naturally more potent than that of England, and the Academies of Paris were chosen as models by the charter members of the new organization.

The year 1778 marks the inception of an ambitious plan, proposed by the Chevalier Quesnay de Beaurepaire. His scheme for the Academy of Arts and Sciences of the United States had been endorsed by the King of France, the Royal Academies of Science and of the Fine Arts, and by Lavoisier, Condorcet and many eminent Frenchmen. The sum of sixty thousand francs was subscribed by wealthy Virginians, and a building was erected in Richmond in 1786. One (French) professor was appointed to make natural history collections and extensive plans for branch

establishments in Baltimore, Philadelphia and New York were contemplated. But the French Revolution put an end to this intellectual exotic.

In the present paper, devoted primarily to the history of the National Academy, we must pass over many interesting developments in the early scientific life of the nation, some of which will be mentioned elsewhere. Reference must be made, however, to the incorporation of the American Association for the Advancement of Science in 1848, and the intense vitality which has enabled this body, in cooperation with many special societies of later origin, to bring the results of scientific research within the reach of an ever-widening public.

Alexander Dallas Bache, superintendent of the United States Coast Survey from 1843 to 1867, and one of the leading spirits of his time, was among the first to express publicly the demand for a national organization of American research officially recognized as such by Congress. In his presidential address to the American Association for the Advancement of Science in 1851 he emphasized the need of "an institution of science, supplementary to existing ones, to guide public action in reference to scientific matters."

Suppose an institute of which the members belong in turn to each of our widely scattered states, working at their places of residence and reporting their results; meeting only at particular times, and for special purposes; engaged in researches self-directed, or desired by the body, called for by congress or by the executive, who furnish the means for the inquiries. . . . The public treasury would be saved many times the support of such a council, by the sound advice which it would give in regard to various projects which are constantly forced upon their notice, and in regard to which they are compelled to decide without the knowledge which alone can ensure a wise conclusion.

. . . Such a body would supply a place not occupied by existing institutions, and which our own

is, from its temporary and voluntary character, not able to supply.³

As president of the American Association, and as a prominent member of the American Philosophical Society and the American Academy of Arts and Sciences, he entertained no misconception regarding the admirable aims and the no less admirable successes of these older societies. Each performed then, as it does now, a useful function of broad scope, which the proposed organization was not to rival but to supplement. The American Philosophical Society continues to exert a wide and useful influence, drawing to its annual meetings in Philadelphia a large body of able men, representing every field of knowledge. Its strong vitality and its traditions of a scholarly past are shared by the American Academy, now rapidly increasing in membership and advantageously established in the permanent home provided for it in Boston by Alexander Agassiz. The American Association, like the British Association for the Advancement of Science, holds its annual meetings in widely scattered cities, thus bringing under its influence a great number of people, whose attention might not be attracted from a distance. Clearly there was still room for an academy chartered by congress and closely related to the national government, to which it might render some such services as the principal countries of Europe receive from their great academies.

Bache's hopes were to be realized twelve years later. On February 11, 1863, Gideon Welles, secretary of the navy, appointed Admiral Davis, Professor Henry and Professor Bache a "Permanent Commission" "to which shall be referred questions of science and art upon which the (navy) department may require information."⁴ En-

couraged by this governmental recognition, Bache, Peirce, Davis, Gould and Agassiz induced Senator Wilson, of Massachusetts, to introduce in congress a bill to incorporate the National Academy of Sciences. This passed the Senate and House on March 3, 1863, and was signed by the president on the same day.

The act of incorporation named fifty men of science as charter members, and limited the membership of the Academy to this number. A second act of congress, passed in 1870, removed this limitation. At present the amended constitution provides that ten new members may be elected annually, and fixes the limiting membership at one hundred and fifty. The actual number of names now on the roll is one hundred and thirty-two. In addition to these there are forty-nine foreign associates and one honorary member.

The list of incorporators contains many distinguished names: Agassiz, Alexander, Bache, Barnard, Dana, Davis, Gilliss, Gould, Wolcott Gibbs, Asa Gray, Guyot, James Hall, Henry Hilgard, Le Conte, Leidy, Lesley, Newberry, Newton, Peirce, Rogers, Rutherford, Silliman, Torrey, Whitney, Wyman—among others equally well known. Chosen from the country at large, and fairly representative of the science of the day, the membership was worthy of a truly national body.

The organization of the National Academy was "the first recognition by our government of the importance of abstract science as an essential element of mental and material progress."⁵ One of the objects in the minds of its founders was to confer distinction on men of science who had accomplished important original research, and thus to encourage and stimulate them

³ *Op. cit.*, pp. 7, 8.

⁴ *Op. cit.*, p. 1.

⁵ From the report for 1867 of Joseph Henry, president of the National Academy, *op. cit.*, p. 14.

to further effort. Another prime object was to aid the government in the solution of problems of a scientific nature. In 1863, the year of the Academy's incorporation, the civil war was in progress, and the government stood in need of just such advice as a body of able scientific men could supply. It will be seen later that the assistance of the Academy was often sought and rendered, not alone in this period, but also in subsequent years.

The idea that a democratic government could not consistently confer distinction upon its citizens, though held by some critics of the day, was not shared by Joseph Henry, whose words may again be quoted from the report cited above:

It is not enough for our government to offer encouragement to the direct promotion of the useful arts through the more or less fortunate efforts of inventors; it is absolutely necessary, if we would advance or even preserve our reputation for true intelligence, that encouragement and facilities should be afforded for devotion to original research in the various branches of human knowledge. In the other countries scientific discovery is stimulated by pensions, by titles of honor and by various social and official distinctions. The French academicians receive an annual salary and are decorated with the insignia of the Legion of Honor. Similar marks of distinction are conferred on the members of the Academy of Berlin and that of St. Petersburg. These modes of stimulation or encouragement may be considered inconsistent with our social ideas and perhaps with our forms of government. There are honors, nevertheless, which in an intelligent democracy have been and may be justly awarded to those who enlarge the field of human thought and human power. Heretofore, but two principal means of distinction have been recognized in this country, viz.: the acquisition of wealth and the possession of political power. The war seems to have offered a third, in bestowing position and renown for successful military achievement. The establishment of this Academy may be perhaps regarded as having opened a fourth avenue for the aspirations of a laudable ambition, which interferes neither with our national prejudices nor our political principles, and which only requires the fostering care of government to be-

come of essential benefit and importance not only to this, but all the civilized countries of the world.⁶

The special problems raised by the civil war emphasized the value of the services which the Academy might render the government, at a period when most of the scientific bureaus of later years were not yet organized. But the war had only an incidental bearing on the designation of the Academy as the scientific adviser of the nation. The desire of President Lincoln and his Secretary of State to receive advice from the Academy on more general questions is shown by the following letter from Secretary Seward to President Bache:⁷

DEPARTMENT OF STATE,
WASHINGTON, January 8, 1864.

Sir: I have the honor to acknowledge the receipt of your note of the 7th instant, tendering to this department the aid of the Academy of Sciences in any investigation that it may be thought proper to institute with a view to the great reform of producing an uniformity of weights and measures among commercial nations. Be pleased to express to the Academy my sincere thanks for this enlightened and patriotic proceeding, and assure them that, with the authority of the President, I shall be happy to avail myself of the assistance thus tendered to me, and to that end I shall at all times be happy to receive the suggestions of the Academy, or of any committee that may be named by it, in conformity with the spirit of the note you have addressed to me.

I am, Sir, your obedient servant,
WILLIAM H. SEWARD

We shall have occasion later to consider how the Academy has assisted the government in the solution of problems of the most diverse character.

The first meeting of the National Academy, attended by more than three fifths of the incorporators, was held at the University of the City of New York on April 22, 1863. Senator Wilson, who had introduced in the senate the bill of incorporation, ad-

⁶ *Op. cit.*, p. 14.

⁷ *Op. cit.*, p. 16.

dressed the Academy at the opening of the first session. After alluding to the fact that the idea of forming such an institution had long existed, he dwelt on the significance of unanimous action by congress at a time when the country was suffering under the burden of the great civil war. With its widely distributed membership, he felt that the Academy would contribute in the future toward the unity and indivisibility of the nation.

With Professor Henry in the chair, and other leaders of American science taking part in the deliberations, the work of the Academy was begun under the most favorable auspices. The constitution and by-laws were prepared by a strong committee, including such men as Agassiz, Benjamin Gould, Peirce and Silliman, with Bache as chairman. After three days of discussion they were adopted by the Academy, and finally ratified at the first Washington meeting, held in one of the committee rooms of the senate on January 4-6, 1864.

In the space at our disposal, we must content ourselves with a brief glance at the principal acts of the Academy during the fifty years of its existence, referring the reader to the work so often cited for further details. In accordance with the terms of the constitution, the members were divided into two classes, (*a*) mathematics and physics, and (*b*) natural history, each class having a chairman and secretary. The names of the sections, and the number of members in each, are given in the following table:

Class of Mathematics and Physics

	Number of Members
Sect. 1. Mathematics	6
Sect. 2. Physics	6
Sect. 3. Astronomy, Geography and Geodesy	9
Sect. 4. Mechanics	6
Sect. 5. Chemistry	3 30

Class of Natural History

	Number of Members
Sect. 1. Mineralogy and Geology.....	6
Sect. 2. Zoology	5
Sect. 3. Botany	1
Sect. 4. Anatomy and Physiology	2
Sect. 5. Ethnology	0 14
Total	44

It is interesting to contrast this organization with that existing at the present time:

Sect. 1. Mathematics and Astronomy....	23
Sect. 2. Physics and Engineering.....	25
Sect. 3. Chemistry	23
	71
Deduct names counted twice.	5
Sect. 4. Geology and Paleontology	24
Sect. 5. Botany	9
Sect. 6. Zoology and Animal Morphology.	18
Sect. 7. Physiology and Pathology	15
Sect. 8. Anthropology and Psychology...	9
	75
Deduct names counted twice	9
Total	66

Total

132

At the outset, two thirds of the members belonged to the class of mathematics and physics, and only one third to the class of natural history. At present, while the two classes no longer exist as such, it is easy to group the members in the same way. Deducting the names counted twice, we find that 66 would now fall in the first class, and exactly the same number in the second. Thus the discrepancy formerly existing between the two classes has been adjusted in the process of time.⁸

It is important to note that the division of members into sections is solely for the purpose of facilitating nominations for new elections, as now provided by the constitution.

⁸ DeCandolle notes a similar preference for the mathematical and physical sciences on the part of the Berlin Academy during the eighteenth century, which was subsequently adjusted by revision of the statutes. ("Histoire des Sciences et des Savants," 2 ed., p. 261.)

In view of the preponderance of physicists, it is not surprising that three fourths of the scientific papers read at the first Washington meeting were connected with the physical sciences. These papers were referred to the committee on publication, with instructions to publish, but the lack of funds for this purpose stood in the way. When the first volume of the *Memoirs* finally appeared in 1866, it contained but two of these papers. It was then planned to print the minor papers in the *Proceedings* of the academy, but this was never done. The first part of the first volume of the *Proceedings* was published in 1877. This contained the constitution and by-laws, reports on the principal business actions of the Academy, and much miscellaneous matter relating to resolutions passed, titles of papers presented, reports of committees, etc. Publication of the *Proceedings* was discontinued in 1895, after three parts had appeared.⁹ In 1881, 649 papers had been read at the scientific sessions. President Rogers, feeling that the Academy would have received much more recognition from the scientific world if these had been printed, strongly and repeatedly urged that the papers be collected annually and transmitted to congress with the report.¹⁰ Unfortunately this was never done, and the reports still give only an abstract of the proceedings, in which the papers appear by title. The importance of reviving and enlarging the *Proceedings* will be discussed in another article.

The Academy has published eleven volumes of *Memoirs*, containing 68 quarto papers, and seven volumes of *Biographical Memoirs* of deceased members, in addition to annual reports and reports of committees.

In view of the existence of a detailed

⁹ *Op. cit.*, p. 44.

¹⁰ *Op. cit.*, p. 51.

history of the Academy, it is quite unnecessary in the present paper to dwell at length upon the events of the first fifty years. A brief outline of the more important work of the Academy is nevertheless essential to clearness, especially in connection with the suggestions for the future which are to be presented later. We may, therefore, consider briefly: (1) the work of the members; (2) the Academy's work for the national government; (3) medals and trust funds, and (4) cooperation in research.

THE WORK OF THE MEMBERS

In his report for 1867 as president of the Academy, Joseph Henry spoke as follows of the conditions of membership:

It was implied in the organization of such a body that it should be exclusively composed of men distinguished for original research, and that to be chosen one of its members would be considered a high honor, and consequently a stimulus to scientific labor, and that no one would be elected into it who had not earned the distinction by actual discoveries enlarging the field of human knowledge.

. . . since the original organization, the principle before mentioned has been strictly observed, and no one has been admitted except after a full discussion of his claims and a satisfactory answer to the question, "What has he done to advance science in the line of research which he has especially prosecuted?"

And again, in his valedictory address to the Academy (1878), Henry returned to this subject.

For this purpose great care must be exercised in the selection of its members. It must not be forgotten for a moment that the basis of selection is actual scientific labor in the way of original research; that is, in making positive additions to the sum of human knowledge, connected with unimpeachable moral character.

It is not social position, popularity, extended authorship or success as an instructor in science, which entitles to membership, but actual new discoveries, nor are these sufficient if the reputation of the candidate is in the slightest degree tainted with injustice or want of truth.

These principles have been observed to the present day, sometimes in the face of great temptation to elect men eminent for achievements other than those of original research. Thus the Academy has counted among its members the large majority of the leaders of American science. While it is of course impossible to describe their individual contributions in these pages,¹¹ some remarks on the progress of American research since the foundation of the Academy will be given in a later paper.

THE WORK OF THE ACADEMY FOR THE NATION

In the first annual report of the president of the Academy, presented to congress in 1864, Professor Bache remarked:

The want of an institution by which the scientific strength of the country may be brought, from time to time, to the aid of the government in guiding action by the knowledge of scientific principles and experiments, has long been felt by the patriotic scientific men of the United States. No government of Europe has been willing to dispense with a body, under some name, capable of rendering such aid to the government, and in turn of illustrating the country by scientific discovery and by literary culture.

In a previous paper the distinctive position held by European academies as organizations of the government, and the services they render to the state, have been briefly described.¹² Here, as elsewhere in these papers, we must not overlook the special conditions which distinguish the National Academy from similar bodies abroad. The Royal Society and the Paris Academy of Sciences, dating from the earliest beginnings of science in England and France, have been the media through which the great advances of more than two

¹¹ Biographies of the incorporators may be found in the "History of the National Academy," so often cited.

¹² SCIENCE, November 14, 1913.

centuries have reached the world. Discovery after discovery, first presented at their meetings and published in their proceedings, has been rigidly associated in the public mind with these great societies, which have fostered science and encouraged the labors of investigators. Thus they have acquired a prestige and a power in the state which could arise in no other way. It is not enough for a nation to charter an organization and to authorize it to act as the adviser of the government in scientific affairs. Appreciation of the fundamental importance of science as the source of all industrial progress, and confidence in the body appointed to advise the nation, are obvious prerequisites to that cooperation between statesmen and men of science which is essential to complete success.

In spite of the disadvantage of a widely scattered membership, whose discoveries and contributions to science have always reached the world through other channels, and with no home of its own to focus attention on its activities, the National Academy has often been called into the service of the country. It will be sufficient to give here a list of the subjects on which the Academy has been consulted by the government, referring the reader to the "History of the National Academy" (pp. 201 to 331) for all details.

COMMITTEES APPOINTED BY THE ACADEMY ON BEHALF OF THE GOVERNMENT

1. Committees appointed in accordance with Acts of Congress.
 - 1871. On the Transit of Venus.
 - 1872. On Preparing Instructions for the *Polaris* Expedition.
 - 1878. On a Plan for Surveying and Mapping the Territories of the United States.
 - 1879. On a National Board of Health.
 - 1894. To Prescribe and Publish Specifications for the Practical Application of the Definitions of the Ampere and Volt.

1908. On the Methods and Expenses of Conducting Scientific Work Under the Government.
2. Committees appointed at the request of Joint Commissions and Committees of Congress.
1884. On the Signal Service of the Army, the Geological Survey, the Coast and Geodetic Survey, and the Hydrographic Office of the Navy Department.
1902. On the Establishment of a National Forest Reserve in the Southern Appalachians.
3. Committees appointed at the request of the President of the United States.
1870. On the Protection of Coal Mines from Explosion by Means of Electricity.
1902. On Scientific Explorations in the Philippines.
4. Committees appointed at the request of the Treasury Department.
1863. On the National Currency (Confidential).
1863. On Weights, Measures and Coinage.
1863. On Saxton's Alcoholometer.
1864. On Materials for the Manufacture of Cent Coins.
1866. On the Prevention of Counterfeiting.
1866. On Spirit Meters.
1866. On Proving and Gauging Distilled Spirits and Preventing Fraud.
1866. On Metric Standards for the States.
1870. On the Effect of Chemicals on Internal Revenue Stamps.
1873. On an International Bureau of Weights and Measures.
1875. On Water-proofing the Fractional Currency.
1875. On Means of distinguishing Calf's Hair from Woolen Goods (Confidential).
1876. On Artificial Coloring of Sugars to Simulate a Lower Grade According to the Standard on which Duties are Levied (Confidential).
1876. On the Use of Polarized Light to Determine the Values of Sugars.
1877. On Demerara Sugars.
1878. On Building Stone to be used for the Custom House at Chicago (no report).
1882. On the Separation of Methyl Alcohol or Wood Spirits from Ethyl Alcohol.
1882. On Glucose.
1882. On Triangulation Connecting the Atlantic and Pacific Coasts (no report).
1884. On Philosophical and Scientific Apparatus.
1885. On the Tariff Classification of Wools.
1886. and
1887. On the Morphine Content of Opium.
1887. On Quartz Plates used in Saccharimeters for Sugar Determinations.
1890. To Formulate a Plan for a Systematic Search for the North Magnetic Pole.
5. Committees appointed at the request of the Navy Department.
1863. On Protecting the Bottoms of Iron Vessels.
1863. On Magnetic Deviation in Iron Ships.
1863. On Wind and Current Charts and Sailing Directions.
1864. On the Explosion on the United States Steamer *Chenango*.
1864. On Experiments on the Expansion of Steam.
1877. On Proposed Changes in the American Ephemeris.
1881. On the Transit of Venus.
1885. On the Astronomical Day, the Solar Eclipse of 1886, and the Erection of a New Naval Observatory.
6. Committees appointed at the request of the War Department.
1864. On the Question of Tests for the Purity of Whiskey.
1866. On the Preservation of Paint on Army Knapsacks.
1867. On Galvanic Action from Association of Zinc and Iron.
1873. On the Exploration of the Yellowstone.
1881. On Questions of Meteorological Science and its Application.
7. Committees appointed at the request of the Department of State.
1866. On the Improvement of Greytown Harbor, Nicaragua.
1903. On the Restoration of the Declaration of Independence.
8. Committees appointed at the request of the Department of Agriculture.
1870. On Silk Culture in the United States.
1881. On Sorghum Sugar.
9. Committees appointed at the request of the Department of the Interior.
1880. On the Restoration of the Declaration of Independence.

1896. On the Inauguration of a Rational Forest Policy for the Forested Lands of the United States.

It will be noticed that many of the questions referred to the Academy are of such a nature that, at the present day, they could be satisfactorily answered by one or another of the scientific departments of the government. This probably accounts for the fact that the requests for the Academy's assistance have become less numerous as the national laboratories and scientific bureaus have multiplied and improved. But after full allowance has been made for such wholly desirable developments, it remains true that questions of broad scope, requiring the cooperation of authorities in several fields of knowledge for their solution, must arise from time to time. In such cases the Academy can afford assistance obtainable in no other way, and an enlightened government will advantageously seek its counsel.

The overthrow of the spoils system in national polities will afford the Academy another opportunity to serve the nation. In France, when a professorship in the national university, or the directorship of a national observatory or laboratory falls

vacant, the Academy of Sciences is requested to present its first and second choice of a successor. The Minister of Public Instruction then appoints one of the nominees to the position. In the United States the need of such counsel is no less urgent than in France.

MEDALS AND TRUST FUNDS

Election to the National Academy has always been appreciated as a high honor by American men of science. Fortunately, however, the recognition and assistance the Academy has been able to afford to investigators has not been confined to the gift of this mark of distinction. From time to time trust funds have been established, the incomes of which are devoted to the award of medals or to grants for research. The will of Alexander Dallas Bache, first president of the Academy, directed that the residue of his estate, after the death of his wife, should be paid over to the National Academy of Sciences for the "prosecution of researches in Physical and Natural Science by assisting experimentalists and observers." Bache's excellent example has often been followed, with the results shown in the following table:

Fund	Established	Original Capital	Present Capital	Purpose
Alexander Agassiz.....	1910	\$50,000.00	\$50,000.00	General use of the academy.
A. D. Bache.....	1879	47,500.00	56,000.00	Researches in physical and natural science.
Cyrus B. Comstock	1907	10,000.00	10,337.50	Prize every five years for investigations in electricity or magnetism or radiant energy.
Henry Draper.....	1885	6,000.00	10,000.00	Medal for investigations in astronomical physics. (Surplus for research.)
Wolcott Gibbs.....	1893	2,673.17	3,000.00	Aid of chemical science.
Benjamin Apthorp Gould..	1897	20,000.00	20,000.00	Researches in astronomy.
O. C. Marsh	1912	9,377.65	9,377.65	Original research in the natural sciences.
John Murray	1911	6,000.00	6,000.00	To found Alexander Agassiz gold medal for original contributions in oceanography.
J. Lawrence Smith.....	1885	8,000.00	10,000.00	Lawrence Smith gold medal for original investigations of meteoric bodies. (Surplus for research.)
J. C. Watson	1883	18,666.82	25,000.00	Gold medal and money prize for astronomical investigations. (Surplus for research.)
Building Fund.....		7,000.00	7,000.00	

The importance of the part played by these funds in advancing science may be illustrated by reference to some of the results obtained.

The Agassiz Fund has proved to be of great value in meeting the general expenses of the Academy, for which there was formerly no provision except the dues of the members.

The Bache Fund made twelve appropriations to Hilgard for his magnetic survey of the United States, four to Langley for his important studies of the physical constitution of the sun, six to Wolcott Gibbs for his researches on complex inorganic acids and his studies of the action of chemical compounds upon the animal system, one each to Newcomb and Michelson for their classic determinations of the velocity of light, three others to Michelson for his equally fundamental optical researches, six to Rowland for his great work in mapping and identifying the lines of the solar spectrum, three to Pickering for his pioneer researches in stellar photography, two to Gould for his measurements of the Cordoba photographs of the southern heavens, six to Boss for his studies of solar and stellar motions and his precise measures of standard stars, and two to Osborn for the work of the Academy Committee on Correlation. These cases include only a fraction of the total number of grants from the fund.

The Barnard Gold Medal for Meritorious Services to Science, awarded every five years by Columbia University to the nominee of the National Academy, has been given to Rayleigh, Röntgen, Becquerel and Rutherford.

The first award of the Comstock Prize of fifteen hundred dollars was made last April to Professor Robert Millikan, of the University of Chicago, for his researches on the charge of the electron and related investigations.

The Henry Draper Gold Medal for astrophysical research has been awarded to Langley, Pickering, Rowland, Vogel, Keeler, Huggins, Hale, Campbell, Abbot and Deslandres. Several grants to assist investigation have also been made from the surplus income.

The capital of the Wolcott Gibbs Fund for chemical research is being increased by additions of accumulated income, and no grants are being made at present. The income of the Marsh Fund is also being added to the capital.

A large number of investigations have been assisted by the Gould Fund, including those of Doolittle, Parkhurst, Yendell, Newcomb, Leavenworth, Comstock and others. At present the income is used mainly for the support of the *Astronomical Journal*.

The Alexander Agassiz Gold Medal, established by Sir John Murray for oceanographic research, was awarded for the first time last April to Dr. Johan Hjort, of the Norwegian Fish Commission, for his valuable contributions to knowledge relating to deep-sea life.

The Lawrence Smith Gold Medal for the investigation of meteoric bodies has been awarded but once, to H. A. Newton, of Yale, for his researches on the orbits of meteors. Appropriations from the fund have supplied Yale University with apparatus for the photography of meteors, and provided for the publication of a catalogue of meteorites, for their chemical analysis and for the study of their luminous trains.

The Watson Fund has aided the important work of Chandler on the variation of latitude, and that of Comstock on the constant of aberration, in addition to many other important grants. Since 1901 the income has been very effectively used by Leuschner in the computation of the perturbations of the asteroids discovered by Watson. The Watson Gold Medal, with

one hundred dollars in gold, has been awarded to Gould, Schönfeld, Auwers, Chandler, Gill and Kapteyn for their astronomical investigations.

In view of its national charter, the high plane of its membership, and its special advantages as the representative of the United States in the International Association of Academies, the National Academy is most favorably qualified for the custody and efficient use of trust funds. Appreciation of this fact, amply indicated by the above list of gifts and bequests, should grow with the reputation of the Academy. It is safe to predict that the privilege of securing the Academy's aid in the control and disbursement of large sums for the benefit of science will be widely sought in the future. In this connection attention should be called to the present lack of medals and funds especially devoted to the recognition and aid of researches in mathematics, engineering, geology and various departments of biology and anthropology.

COOPERATION IN RESEARCH

As an agent for the furtherance of co-operative research, the National Academy occupies a unique position among American societies. In these days of far-reaching investigations, involving the common action of men of science distributed throughout the world, the great majority of cooperative projects are international in character. Here the peculiar advantage of the Academy appears. The International Association of Academies is made up of the national academies of sixteen countries. Each academy is pledged to support only such cooperative undertakings as are endorsed by the association. Thus the constituent members of this body, through their delegates at its triennial meetings, are most favorably placed for

the initiation and furtherance of such international movements.

As an illustration of the work already undertaken by the National Academy in this field, mention may be made of the International Union for Cooperation in Solar Research. In 1904, the Academy, through its Committee on Solar Research, invited various academies, physical and astronomical societies, and other organizations interested in the subject, to send delegates to a conference, with a view to the initiation of international cooperation in this field. Meetings have since been held at Oxford in 1905, Paris in 1907, Mount Wilson in 1910 and Bonn in 1913. The constituent societies, each of which is represented in the Union by a standing committee, are as follows:

The Royal Society of London, the Academies of Amsterdam, Barcelona, Berlin, Paris, St. Petersburg, Stockholm and Vienna, the Swiss Society of Natural Sciences, the Astronomical Societies of London, America, France and Canada, the Physical Societies of Berlin, Italy, Spain, France and America, the Society of Italian Spectroscopists, the Solar Physics Committee, the Solar Sub-committee of the International Meteorological Committee and the National Academy of Sciences.

The standards of wave-lengths which are being established by the Union, as the result of extensive cooperative studies, will be used universally by spectroscopists. International committees, appointed by the Solar Union, are studying the solar rotation, the spectra of sun-spots and the intensity of the solar radiation, on a common plan. Spectroheliographs are also in use, for the almost continuous photography of the sun, at the observatories of Kodai-kanal, India; Catania, Sicily; Potsdam, Germany; Meudon, France; Tortosa, Spain; Cambridge, England; Williams

Bay, Wisconsin; Tacubaya, Mexico; and Mount Wilson, California.

A new solar observatory, which is about to be established in New Zealand through the generosity of Mr. Thomas Cawthron, will fill the gap in longitude between California and India, and thus aid in keeping the rapidly changing phenomena of the solar atmosphere constantly under observation. At the Mount Wilson meeting of the Union, it was decided to enlarge its scope so as to include the whole range of astrophysics, and a representative committee was appointed to report on the classification of stellar spectra. It is now evident that the Solar Union is destined to play an increasingly important part in the field of international research.

The Solar Union is one of the organizations endorsed by the International Association of Academies, to which it makes regular reports. Another of the international investigations conducted under the auspices of the association is that of the Brain Commission, the American Committee of which is also closely related to the National Academy.

The Committee on International Paleontologic Correlation, appointed by the Academy in 1908, has recently completed its work. Aided by the Bache Fund, the committee has pushed forward the important work of correlating the geologic formations of Europe and America on the basis of their paleontologic contents. The results have been published in a series of papers, by members of the committee, most of which treat of the mammals of the tertiary epoch and the formations which contain them in North America. Marsh and Cope dealt with the formation of the American Eocene as units, even when their thickness ranged from 1,000 to 2,000 feet. These formational units have now been split up into sub-units, or life zones,

usually distinguished by geologic discontinuity. At the same time there has been a marked increase in the precision of recording the succession of species in certain formations which contain several levels of life zones, thus permitting exact comparisons with other life zones to be instituted. The importance of such work is obvious in connection with the trend and rate of development in different parts of the world, the possibility of geographic intercourse at certain epochs, and the cycles of physiographic and climatic change.

It is thus evident that the Academy is in a most favorable position to extend its operations in the field of international research, where the advantages of its national and representative character are felt to the full, and the disadvantages of its scattered membership are of minor importance.

From this brief survey it appears that the National Academy of Sciences, in spite of many obstacles, has played an important part in the development of American science. The time is now favorable for an extension of its work into new fields, which must be occupied if the special opportunities and obligations implied by the Academy's national charter are to be fully realized. In a later article some of the possibilities of future progress will be considered.

GEORGE ELLERY HALE
MOUNT WILSON SOLAR OBSERVATORY

*THE PLAN OF WORK IN CONNECTION
WITH A NEW MARINE LABORATORY
ON THE PACIFIC*

DURING the past summer a new marine station was erected at Laguna Beach, California. At this place the varied and rocky coast offers peculiar advantages for the study of plant and animal life. The situation, too, is convenient for those in southern California, being within fifty miles from Los Angeles and easily accessible from other cities and towns.

The wealth of life at Laguna has attracted students of Pomona College during the past three years to visit this region for summer work. The growing interest of students and others in sea-side studies led to the erection of an adequate building. This contains two general laboratories, dark room, store rooms, aquarium for living specimens and nine private laboratories with fresh and salt water. There is in addition to the main building a tank house with two more rooms. The laboratory is established chiefly for teaching purposes, but there are facilities for a limited number of investigators. The plan of investigation and to some extent the work of teaching is organized along a definite line.

The laboratory is but one station for zoological work. The other center is situated fifty-five miles inland at Pomona College, Claremont. Between the two stations there are ranges of hills, low mountains with small streams and lakes, and great level stretches. Back from Claremont and the college buildings the mountains of the San Gabriel range, often covered with snow, rise to an elevation of ten thousand feet, and beyond them stretches the desert with its lower ranges and arid valleys. In this area a careful survey is to be made of all groups of living things, not all at once, but bit by bit, not by a few, but by many.

Some of the advantages of the location and of the climate are such as to contribute to the success of the enterprise. Field work may be undertaken at all times during the year at Laguna and to a large extent about Claremont. One of the chief recreations of the students is in the form of long or short expeditions into the mountains, and their services are enlisted to obtain specimens from different regions of high and lower altitude. In this way many interesting things have already been brought to light. Some species, for instance, are found to have a very local distribution on some mountain slope or in the depths of some scarcely accessible canyon. Besides the collection of specimens, there are possibilities in the way of observation of large animals, such

as mountain sheep, deer, mountain lions and many smaller mammals and birds.

One of the features of class exercises in introductory courses is the collection of entomological and other zoological specimens with full data, as well as field work of other kinds. By these means the student obtains knowledge of the different animal groups, and the rough materials for more careful investigations are collected. For the more advanced workers special groups or special problems are studied in the field or in the laboratory. The necessary determinations are made so far as possible by the students, but their material is sent to specialists for confirmation. The results of this survey are not to be confined to mere records of species, but so far as possible in every group an attempt will be made to determine the adaptations to the environment, the relation of the insects and other forms to the cultivated plants in the region. Records are to be kept of climatic conditions from season to season and from year to year. Specimens collected at various times are kept with date and locality label until special students or specialists can determine them. At no time will the work on a particular family, order or class be regarded as finished, but from month to month new records are to be added. Although systematic investigations may come first in point of time, the effort will be made to determine other things from the material as occasion arises. This will necessitate a broad study of plant forms, topographical and climatic factors, as well as the interrelations of the animals studied. Knowledge of life histories and habits will also be a natural feature of the work.

There is so much ground to cover in this great outline, that it will be years before much of an impression is made upon the unknown, and it may be a long time before certain isolated facts seem to have any value or bearing on the rest. It is the purpose before long to have a special fireproof room to keep the specimens and records for the use of present workers and for the future. These data ought to be very valuable in a few years to many special

investigators. Some of the results of the work appear from time to time in the *Journal of Entomology and Zoology*, which is published quarterly by the college.

There are of course great gaps in the whole plan. Only here and there can a little be done at a time, but it is believed that by encouraging classes and individuals to collect data and specimens, and, when well trained, to record observations of a more difficult nature, we have an opportunity to do a great work which is unique and can not help but benefit all who partake in the effort. Whatever may be the value of the facts obtained and tested, whatever the value of the discovery of new species or new adaptations, there is, I believe, the value of method for the beginning student or the more advanced one. It will not matter what study he pursues after leaving college for the university; an awakened interest in things out of doors, an increased accuracy of observation should result. It seems to me too that the thought of contributing something to science, no matter how small a fact, ought also to be a stimulus in the future as it has been in the past.

WILLIAM A. HILTON

POMONA COLLEGE,
CLAREMONT, CAL.

WINSLOW UPTON

WINSLOW UPTON, professor of astronomy and director of the Ladd observatory at Brown University, died of pneumonia, at Providence, on January 8, in the sixty-first year of his age. His forbears were of north England origin but early in the seventeenth century the founder of the New England family emigrated to Massachusetts. Professor Upton was born on October 12, 1853, and was the fourth son of James Upton, a prominent merchant of Salem, Mass., and a liberal contributor to Brown University. Entering Brown in 1871 he was graduated as valedictorian of the class of 1875. He had attained to almost equal excellence in the pursuit of studies in ancient classics and in science, but he felt that his forte was rather in the line of scientific investigation. So he turned to the University of Cincinnati for

graduate work in astronomy and was there awarded the degree of A.M. in 1877. His alma mater conferred on him the honorary degree of Sc.D. in 1906.

He was assistant in the astronomical observatory at Harvard, 1877-79; assistant engineer in the U. S. Lake Survey at Detroit, 1879-80; computer in the U. S. naval observatory at Washington, 1880-81; computer and assistant professor in the U. S. Signal office, 1881-84.

In 1884 he was appointed professor of astronomy at Brown University and since 1891 he has been both professor of astronomy and director of the Ladd observatory (the gift of the late Governor H. W. Ladd) which was built under his supervision. The facilities of the observatory have been used chiefly to aid in the instruction of the university, in the maintenance of a local time service, and in regular meteorological observations in cooperation with the U. S. Weather Bureau.

Professor Upton has been connected with a number of important scientific parties. He was a member of the U. S. astronomical expeditions to observe the total eclipse at Denver, Colorado, in 1878, and at the Caroline Islands in the South Pacific, in 1883. He also observed the solar eclipse of 1887 in Russia, that of 1889 in California, of 1900 in North Carolina, and during a sabbatical year, 1896-97, he was attached to the southern station of the observatory of Harvard College, at Arequipa, Peru.

Professor Upton's publications, for the most part in the department of meteorology, include the following:

1. "The Solar Eclipse of 1878," a lecture before the Essex Institute (*Bulletin of the Essex Institute*, Vol. 11. 1879; reprinted, pp. 19).
2. "Photometric Observations Made Principally with the Equatorial Telescope of Fifteen Inches Aperture During the Years 1877-79"; by E. C. Pickering, C. Searle and W. Upton (*Harvard Astr. Obs. Ann.*, Vol. 11, 1879, pp. 317).
3. "Information Relative to the Construction and Maintenance of Time-balls" (Wash-

ington, 1881, pp. 31 + 3 pls., U. S. War Dept. Professional papers of the Signal office, No. 5).

4. "Lectures on Practical Astronomy," 1882 (Report of the Chief Signal Officer, Washington, 1882, pp. 104-120).

5. "On the Methods Adopted in the Computation of Barometric Reduction Constants" (Report of the Chief Signal Officer, Washington, 1882, appendix 61, pp. 826-846, Washington, 1883).

6. "The Use of the Spectroscope in Meteorological Observations" (U. S. signal service notes, No. IV., pp. 7 + 3 pls., Washington, 1883).

7. "Report of Observations Made on the Expedition to Caroline Islands to Observe the Total Eclipse of May 6, 1883" (reprinted from *Memoirs of the National Academy of Sciences*, Vol. 2, Washington, 1884, pp. 64 + 7 pls.).

8. "Distribution of Rainfall in New England February 10-14, 1886, from Observations reported to the New England Meteorological Society" (reprinted from SCIENCE of March 19, 1886, *Providence*, 1886, pp. 8).

9. "An Investigation of Cyclonic Phenomena in New England" (1887).

10. "Meteorological Observations During the Solar Eclipse August 19, 1887, at Chlamostina, Russia" (reprinted from the *American Meteorological Journal*, Ann Arbor, 1888, pp. 25).

11. "The Storm of March 11-14, 1888" (reprinted from *American Meteorological Journal*, May, 1888, pp. 19).

12. "Characteristics of New England Climate" (*Harvard Astr. Obs. Ann.*, Vol. 21, 1890, pp. 265-273).

13. "Meteorological and Other Observations Made in Connection with the Total Solar Eclipse of January 1, 1889, at Willows, California," by W. Upton and A. L. Rotch (*Harvard Astr. Obs. Ann.*, Vol. 29, 1892, pp. 34 + 2 pls.).

14. "Star Atlas, Containing Stars Visible to the Naked Eye and Clusters, Nebulæ, and Double Stars Visible in Small Telescopes . . . and an Explanatory Text" (Boston, Ginn and Co., 1896, pp. iv + 34).

15. "Geographical Position of Arequipa Station" (*Harvard Astr. Obs. Ann.*, Vol. 48, 1903, pp. 52 + 1 pl.).

He was also the contributor of numerous short articles to the *Astronomische Nachrichten* since 1877, to *Zeitschrift für Meteorologie, Siderial Messenger, Popular Astronomy, Science, American Meteorological Journal, Astronomical Journal* and other scientific publications. For over twenty years he wrote monthly letters on astronomical topics for the *Providence Journal* and was editor of the astronomical part of the *Providence Journal Almanac 1894-1910*.

Professor Upton was a fellow of the American Association for the Advancement of Science, a member of the Deutsche Meteorologische Gesellschaft, of the Phi Beta Kappa, Sigma Xi Societies and of the Delta Upsilon fraternity. He married, in 1882, Miss Cornelia Augusta Babcock, of Lebanon Springs, N. Y., and their two daughters are graduates of Smith College.

At Brown University Professor Upton was secretary of the faculty 1884-91, Dean 1900-1901, one of the committee on organization of the movement to increase the university endowment 1910-11; and, for more than a score years, a member of important administrative committees. He was also an active church worker, endowed with rare simplicity, genuineness, and warmth of Christian faith, and, at different times, glee-club and choir leader, and organist. His musical talents (so often the possession of astronomers and mathematicians) were inherited from his father; the George P. Upton who has given us many a pleasing volume on musical topics is a distant relative.

Professor Upton was possessed of unusual scientific ability, coupled with brilliancy and rare clarity of thought and power of exposition of intricate subjects. Too much, it seemed to some, did the university demand of his time and strength to deal with administrative problems, when he might so easily have multiplied his contributions to science. That extensive projects in this direction were contemplated are indicated by manuscripts left behind. He had a good deal of personal

magnetism, a joyous appreciation of refined humor, and was constantly in demand as a lecturer. In the class-room he displayed exceptional power to arouse enthusiasm. He was tactful and of judicial temper, a man inspired with the highest ideals in the conduct of life and possessed of unfailing patience, of great tenderness of heart and kindness of spirit. He was beloved alike by colleagues and students.

Only a week ago, our friend was in the classroom. Because of the tragic swiftness of his passing—for just the other day he seemed to us but in the prime of bodily and mental vigor—a pregnant hush of introspection pervades the academic community. This afternoon his body was borne to his native city.

“Warte nur, balde
Ruhest du auch.”

R. C. ARCHIBALD

BROWN UNIVERSITY,
January 10, 1914

SCIENTIFIC NOTES AND NEWS

THE fourth annual award of the Willard Gibbs Medal, founded by Mr. William A. Converse, will be made by the Chicago Section of the American Chemical Society to Dr. Ira Remsen, of Johns Hopkins University. The previous recipients of this medal are Professor Svante Arrhenius, Professor Theodore W. Richards and Dr. Leo H. Baekeland. The formal presentation will be made to Dr. Remsen at the May meeting of the Chicago Section of the American Chemical Society. Dr. Remsen has formally signified his acceptance of this award. The jury of award which selected Dr. Remsen comprised Mr. William Brady, Mr. G. Thurnauer, Dr. E. C. Franklin, Dr. W. R. Whitney, Professor J. H. Long, Professor J. Stieglitz, Professor Alexander Smith, Professor W. A. Noyes, Mr. E. B. Bragg, Mr. S. T. Mather, Professor W. H. Walker and Professor T. W. Richards.

AT the recent meeting of the American Physical Society at Atlanta, in connection with the American Association for the Advancement of Science, the following officers were elected for 1914: President, Ernest Mer-

ritt, of Cornell University; Vice-president, Karl E. Guthe, of the University of Michigan; Secretary, A. D. Cole, of the Ohio State University; Treasurer, J. S. Ames, of the Johns Hopkins University; Members of Council, G. K. Burgess, of the Bureau of Standards, and D. C. Miller, of the Case School of Science; Managing Editor of *Physical Review*, F. Bedell, of Cornell; Editorial Board, A. G. Webster, of Clark University, C. E. Mendenhall, of the University of Wisconsin, and H. A. Bumstead, of Yale University. The next two meetings of the Physical Society will be at Columbia University, New York, on February 28, and at the Bureau of Standards, Washington, on April 24 and 25.

DR. AUGUST WEISMANN, professor of zoology at Freiburg, celebrated on January 17 his eightieth birthday.

THE Imperial Society of the Friends of Natural History, Anthropology and Ethnology, of Moscow, have elected Professor W. M. Davis to permanent membership.

THE Imperial Academy of Sciences of St. Petersburg has elected Sir Edward Thorpe as a corresponding member.

PROFESSOR SILVANUS P. THOMPSON has been elected a corresponding member of the Academy of Sciences of Bologna.

PROFESSOR JOHANNES ORTH, head of the pathological laboratory at the University of Berlin, has been elected an honorary member of the London Institute of Hygiene.

DR. JOSEPH T. ROTHRICK, who is now seventy-four years old, has resigned as a member of the Pennsylvania State Forestry Board after serving for twenty years, in order to devote more time to private work.

OCTAVE CHANUTE medals have been awarded by the Western Society of Engineers for the best three papers presented during the year 1913 as follows: mechanical and electrical engineering, Mr. W. L. Abbott on “The Northwest Station of the Commonwealth Edison Company”; general engineering, Mr. Onward Bates on “Arbitration”; civil engineering, Mr. D. W. Mead on “The Cause of

Floods and the Factors that Influence Their Intensity."

MONTYON prizes, each of the value of \$500, have been given by the Paris Academy of Sciences to Mme. Lina Negri Luzzani, for her studies on the corpuscles discovered in the nervous system of rabid animals, to L. Ambard, for his memoir on renal secretion, and to MM. A. Raillet, G. Moussu and A. Henry, for their researches on distomatosis in ruminants. Awards of \$300 each have been made to M. Marquis, for his memoir on mercuric chloride in surgery, to M. Legrange, for his work on the treatment of chronic glaucoma, and to Fernand Bezançon and S. L. de Jong, for their treatise on the examination of sputa.

PROFESSOR W. E. CASTLE, of Harvard University, has been reappointed a research associate of the Carnegie Institution for a period of five years with an annual grant of \$2,500 in support of his researches in heredity. This is the third five-year appointment as research associate received by Professor Castle from the Carnegie Institution.

THE American Microscopical Society held only business meetings at Atlanta. Professor Charles Brookover, Little Rock, Arkansas, of the University of Arkansas Medical School, was elected president; Miss Margaret Ferguson, Wellesley College, first vice-president, and Dr. H. L. Shantz, Bureau of Plant Industry, Washington, D. C., second vice-president. T. W. Galloway, of Millikin University, was reelected secretary and editor of the *Transactions*. Mr. Magnus Pflaum, of Meadville, Pa., who has served the society so faithfully for years as its custodian and has built up the research fund to nearly \$5,000 was elected to honorary membership.

PROFESSOR CARLOS E. PORTER, director of the *Revista Chilena de Historia Natural* and professor of zoology and entomology at the Agricultural Institut of Chile, has been made vice-president, for 1914, of the Sociedad Cientifica de Chile and honorary professor of zoology at the Agricultural College of the University of Manaos (Brazil).

DR. T. A. JAGGAR, director of the observation station at Kilauea, Hawaii, has gone to Japan, to study the phenomena of the volcanic eruption on Sakura.

DR. J. B. JOHNSTON, professor of anatomy in the University of Minnesota, has sailed for Europe, on leave of absence for the second semester. He will return about September 1.

DR. OTIS WILLIAM CALDWELL, associate professor of botany in the School of Education and dean of University College at the University of Chicago, has been granted leave of absence during the next two months for a visit of inspection to the high schools and colleges of the south with reference to the teaching of science.

LLOYD W. STEPHENSON, of the United States Geological Survey, is to be at the University of California from January to June, 1914, as acting professor of paleontology, during the half year's absence of Professor J. C. Merriam, who is spending this semester preparing for the publication of some of the results of his collections from the pleistocene asphalt beds of Rancho LaBrea, near Los Angeles.

MRS. HUNTINGTON WILSON has established for the year 1914 a lectureship in eugenics, and has placed a fund of \$2,500 for the purpose in the care of the Eugenics Record Office of Cold Spring Harbor, N. Y. Mr. A. E. Hamilton, of Clark University, has been appointed to this lectureship and will be available for colleges, societies and clubs.

PROFESSOR GEORGE C. WHIPPLE, of Harvard University, delivered a lecture on "Relative Values in Sanitation" before the Science Club of the University of Wisconsin on January 22, 1914.

PROFESSOR ARTHUR H. BLANCHARD, in charge of the graduate course in highway engineering at Columbia University, on January 26 delivered illustrated lectures at the University of Illinois on the subjects: "Bituminous Surfaces and Bituminous Pavements" and "Modern Developments in Highway Engineering in Europe."

PROFESSOR GEO. GRANT MACCURDY, of Yale, delivered the fourth of the winter series of

public lectures under the auspices of the Pennsylvania State Museum and the Harrisburg Natural History Society at Harrisburg, Pa., on January 21, 1914. He lectured upon "The Antiquity of Man in the Light of Recent Discoveries."

DR. MAYVILLE W. TWITCHELL, the assistant state geologist of New Jersey, has just finished a course of five lectures on "The Geology of New Jersey" before the combined classes of the department of geology at Rutgers College.

PROFESSOR BALDWIN SPENCER lectured on January 27 before the Royal Anthropological Institute on the life of the Australian tribesmen. The lecture was illustrated by means of kinematograph films and phonograph records.

MR. ALEXANDER GEORGE MCADIE has been given the title Abbott Lawrence Rotch professor of meteorology, in memory of the late Professor Rotch.

A COMMITTEE has been formed to establish scholarships in memory of Lord Avebury at the University of London. The sum of \$15,000 has already been subscribed for this purpose.

THE centenary of the birth of Claude Bernard was celebrated at the Collège de France on December 30.

THE tablet unveiled at King's College by Lord Rayleigh on January 14 to the memory of Lord Lister bears the following inscription:

In affectionate and respectful memory of Joseph Baron Lister, F.R.S., O.M., professor of clinical surgery in King's College from 1877-1892, and for many years consulting surgeon to the King's College Hospital, member of the council and life governor of the college, this tablet is erected. His name will be handed down to posterity as the founder of antiseptic surgery, one of the greatest discoveries in history, and a source of inestimable benefit to mankind.

MR. W. D. MARKS, professor of mechanical engineering at the University of Pennsylvania from 1876 to 1887, later a consulting engineer in New York City, has died at the age of sixty-four years.

PROFESSOR AARON HODGMAN COLE, of the Chicago Normal School, known for his writings and lectures on biology, has died at the age of fifty-seven years.

THE death is announced of Dr. J. Schreiner, astronomer in the Potsdam Astrophysical Observatory.

THE late Edward Ginn has bequeathed \$800,000 for the World's Peace Foundation which he had established; Tufts College receives \$10,000 and one tenth the residue of his estate.

THE Swedish Antarctic committee, an association formed last year with Admiral Palander at its head, has planned an expedition which will start in the autumn of 1915. The cost of the expedition will be \$72,360.

DISPATCHES from Dr. Percival Lowell at his observatory at Flagstaff, Ariz., announce that he is using the forty-inch Clark reflecting telescope on Mars with full aperture. The definition he declares to be perfect, the canals being sharp lines.

AN organization dinner for the discussion of plans for the International Electrical Congress at San Francisco in September, 1915, is to be held at the Engineers' Club, New York City, Wednesday evening, February 25.

ARRANGEMENTS are being made for an exhibition of physical apparatus at the joint meeting of the American Physical Society and of the electrophysics committee of the American Institute of Electrical Engineers, to be held on April 24 and 25 at the Bureau of Standards, Washington. The opening of the new electrical building of the bureau will add interest to the occasion, and incidentally will furnish abundant room for a large exhibit of apparatus. It is hoped that designers and makers of apparatus will unite to make this a truly representative exhibition. Unfortunately expenses of transportation and mounting of exhibits must be borne by the exhibitors. The Bureau of Standards can give only a limited amount of help in mounting. Exhibits of any considerable size should be unpacked and mounted, and repacked and cared

for by the exhibitors. Any packages or boxes sent to the Bureau of Standards should be clearly marked "for Physical Society exhibit" and *prepaid*.

FORESTERS and lumbermen see in a decision of the Treasury Department in regard to the administration of the income tax a strong argument for forestry. As they interpret the opinion of the treasury officials they understand that no timberlands shall be subject to the tax until the lumber is cut and marketed and that then the profit only will be subject to an income tax assessment. In other words, all costs will be deducted before the tax is levied, and these will cover the cost of growing the timber, including the cost of planting where necessary and of protecting the growing crop from fire and other depredation. This decision was based upon a request for information made by P. S. Ridsdale, secretary of the American Forestry Association. He asked if there would be a tax on the value of the yearly growth of timber whether it was cut or not, and also whether an income tax would be assessed on the values of the timberland. In reply, the Treasury Department said that the gain from the cutting and disposal of stumpage is realized in the year during which the timber is cut and disposed of, and that the amount received in excess of the cost of such timber is profit, and should be so accounted for as income for that year.

UNIVERSITY AND EDUCATIONAL NEWS

THE late Morrill Wyman, of Cambridge, has left to Harvard College \$50,000, to be used to promote good citizenship by the study of republican government. Further, one half of the residue of his estate, which is said to be large, is left to Harvard to establish a fund in memory of his father, to be known as the Morrill Wyman Medical Research Fund, to provide for the study of "the origin, results, prevention and treatment of disease." A further sum of \$50,000 will ultimately go to this fund. Another fourth of the residue of the estate is left to the Massachusetts Institute of Technology, to be used in aid of deserving and promising students.

THE gift of \$125,000 by an unknown friend for a children's department has now completed the fund of \$615,750 which has been raised for building a new teaching hospital for the University of California Medical Department. Among the other principal contributors are John M. Keith, of San Francisco, who has given \$150,000 in memory of his wife, and four members of the Crocker family, who have given \$150,000 in memory of George Crocker, himself the founder of the Crocker cancer research fund of Columbia University. The givers of the George Crocker fund are Mrs. Harriet F. Alexander, \$50,000; William H. Crocker, \$50,000; Charles Templeton Crocker, \$25,000, and Mrs. Malcolm Whitman, \$25,000.

THE University of Chicago will erect three new buildings this year at a cost of \$800,000. They are the women's gymnasium and club, the geology building and the classics building. Announcement has been made that building operations will be started so that cornerstones of the geology and classics buildings may be laid at the March convocation.

WITH the object of stimulating interest in scholarship among high school students of the community, four competitive scholarships have been established in Adelbert College of Western Reserve University.

THE sixth session of the graduate school of agriculture will be held at the College of Agriculture of the University of Missouri, beginning on June 29, 1914, and continuing four weeks. Only persons who have completed a college course and taken a bachelor's degree will be admitted to the privileges of the school, except that admission may be granted to non-graduates who are recommended by the faculties of the college with which they are associated as persons properly qualified to profit by advanced instruction in agriculture. The faculty will include leading scientific men and experts from the U. S. Department of Agriculture, the agricultural colleges and experiment stations, and other universities, colleges and scientific institutions in America and Europe.

MERRITT BERRY PRATT, now deputy supervisor of the Tahoe National Forest, has been

appointed assistant professor of forestry in the University of California, in the new department of which Walter Mulford, now professor of forestry at Cornell, is next August, to become the head.

DR. ALBERT N. GILBERTSON has charge of the instruction in anthropology at the University of Minnesota in the absence on leave of Dr. A. E. Jenks.

DR. OSCAR PERRON, of Tübingen, has been called to a professorship of mathematics at Heidelberg.

DISCUSSION AND CORRESPONDENCE

WHAT WAS THE CAUSE OF THE ESKERS?

TO THE EDITOR OF SCIENCE: Eskers are features of the earth's surface well known to all students of glacial phenomena. They are more or less well defined ridges composed of mixtures of sand, gravel, clay and boulders, having a direction generally parallel to that of the movement of the latest ice sheet that covered the region where they occur, or normal to the front boundary of the sheet, and they often have a length of many miles, though entire continuity rarely exists throughout the length of any one such ridge or series of ridges having such relations as to be considered as one esker. In some cases such ridges have a striking uniformity in height and cross section, with an abruptness of side slopes and an alignment that suggest an artificial embankment like that for a railroad or a levee. Other forms that have been called eskers are flattened and spread out, broken into detached ridges that often depart from parallelism, and these are frequently associated with knolls and irregular hummocks and valleys that would not be considered as related in any way to esker forms if they stood by themselves. Eskers in the United States have been described and illustrated in several publications of the United States Geological Survey, as well as in various papers and geological text-books. They are numerous and extensive in the eastern part of that portion of North America that was covered by the latest ice sheet, particularly in Maine, New Brunswick and the

eastern Canadian provinces. Several examples on a smaller scale are found in the Great Lakes region of the United States. The writer has examined more especially the eskers near Circleville, south of Norwalk, and near Kenton, in Ohio; the one north of Muncie, Indiana, the fine example near Kaneville, Ill., and the strikingly uniform and conspicuous esker ridge at Mason in southern Michigan. Casual examination has also been made of similar ridges in Ontario, Canada.

The theory to account for these ridges which is most often met with is that they were formed by stream action, in crevices or in tunnels under the ice, during the period of recession or withdrawal of the ice sheet. From the published descriptions and views and sketches of eskers and from the examinations above referred to, I became satisfied that this theory was untenable, although there are some evidences that stream action has had a secondary and modifying effect on the final esker forms in some cases. I concluded that the eskers resulted primarily and principally from cracks in an ice sheet of moderate thickness covering approximately smooth and level areas of considerable extent; these cracks becoming the locus of the accumulation of the esker material from the lateral "shove" of the separated parts of the ice sheet under the influence of seasonal changes of temperature. This action resulted in the upheaval and breaking of the ice along the initial crack, and the melting of the resulting broken ice at a rate greater than that of the main ice sheet due to increase of exposed surfaces, with the accumulation of the general surface earthy material as well as that imprisoned within the ice itself along a more or less well-defined line. This earthy material remained, of course, after the ice disappeared, and it was often modified to a greater or less extent by flowing water during the melting of the ice. I prepared a tentative memorandum setting forth this view some three years or more ago, but it was not published. The illustrated supplement of the *New York Times* of November 23 contains a photographic view of a "pressure ridge" in a sheet

of sea ice, taken from Captain Scott's narrative of his South Pole expedition, which recalls the subject to mind. This picture seems to afford a very decided support for the above theory.

I conceive that the conditions under which eskers were formed were similar to those illustrated by this view of a pressure ridge, although in this case the ridge is understood to have been formed in ice resting on water. It is possible that at the time of the formation of the esker ridges the movement of the ice was facilitated by water underlying the sheet over considerable areas, so that the ice was partially afloat at least for portions of each year.

Very pronounced ridges of boulders and other material are formed under weather conditions now existing around the shores of small interior lakes in cold climates by the "push" of the ice that covers the lakes each winter.

I believe that the seasonal variations in temperature that must have occurred even during the low average temperature of the glacial period, with resulting changes in the internal structure and movements of the ice, constituted an influence of more importance in connection with general glacial phenomena than has heretofore been recognized.

The "trough" or depression along one or both sides of the ridge which sometimes occurs as a marked feature in connection with an esker was probably due primarily to the greater scooping and shoving effects of the ice on the underlying earth material immediately adjacent to the ridge, on account of the broken condition of the ice and the increased weight resulting from increased thickness and the superimposed broken blocks and fragments. The esker ridge itself and such side depressions would sometimes determine or materially modify the immediate post-glacial drainage of the locality, when the depressions would become still further emphasized by stream erosion during and after the melting of the ice. Furthermore, the "delta formation" sometimes found near the end of the esker is thus explained.

A theory similar to the above is applicable to certain irregular detached groups of knolls

or hummocks and short ridges with intervening troughs and hollows, called *kame* areas. Some examples of these may mark a sort of focus for the lateral shove from various directions of the surrounding ice sheet. In at least one locality that has been studied in considerable detail the assumption of the formation of an interglacial ridge by a process similar to that described above, but with a direction transverse to that of the general movement of the ice sheet, seems to afford a clue to an explanation of several surface features of the vicinity, and possibly this may also apply to some special cases where there has been difficulty in fitting the terminal moraine theory with entire satisfaction.

The probability of an extensive ice sheet of moderate thickness in comparison with that of earlier ice "invasions" of the same area, and as the final stage of the glacial period for the region in question, suggests other interesting deductions in connection with the causes of present surface forms. JOHN MILLIS

November 25, 1913

MATTER AND MEMORY

ON reading with interest the article of Professor R. D. Carmichael, SCIENCE, December 19, I find on page 869 a statement which can not pass as entirely general: ". . . mind . . . has chosen to assume that matter is without memory."

While in abstract reasoning we prefer to assume that matter has no memory, nevertheless we well know that in all too many cases this assumption is made for simplicity, not for exactness. The existence of zero drift, permanent set, elastic, magnetic and dielectric hysteresis, etc., so complicates the actual conditions, by making them dependent on the previous experiences of the material under consideration, that we can not set up ideally exact general equations. The complications are by no means as overwhelming as those, for example, which present themselves in dealing with warm-blooded animals, but they are real. What the instrument-maker desires is matter which does forget, whether he be interested in galvanometer suspensions or transformer cores. To speak figuratively, the suspension "re-

members" previous torsion, and precision is impaired; the iron "remembers" the preceding cycle, and energy is wasted in concentrating its wandering attention.

Not the least remarkable thing about falling stones, and gravitational action in general, is the lack of hysteresis, or memory.

WILLARD J. FISHER

NEW HAMPSHIRE COLLEGE,
DURHAM, N. H.

LAG AND LEAD WITH A BRAUN TUBE

IN arranging an experiment to show lag and lead with a Braun tube I hit upon a method that was very effective and may possibly be of use to others.

The tube, with its axis horizontal, was excited by an induction coil with a break of variable speed. Two coils were used to produce the magnetic field, one with its axis vertical, and the other with its axis horizontal, and both with axes perpendicular to the axis of the tube. The distance of the one coil from the tube could be varied. If an alternating current was sent through the coil with horizontal axis it would produce a vertical line on the fluorescent screen when the tube was excited. If now the period of the vibrator of the coil was changed until the frequency of the alternating current was nearly equal to a multiple of the frequency of the coil the stroboscopic effect would make the spot of light move slowly up and down on the screen. With the current flowing through the other coil the spot would move back and forth on the screen. When the alternating current from the same source is led into both coils the spot moves up and down diagonally at an angle of 45°.

If now considerable inductance is introduced into one circuit the spot will move around in an ellipse in one direction, but if a condenser takes the place of the inductance the spot moves in an ellipse in the opposite direction. Varying the inductance varies the width of the ellipse so that the amount of lag or lead is roughly indicated. If both inductance and capacity are put into the same circuit the width of the ellipse is reduced,

showing the neutralizing effect of capacity on inductance.

JOHN FRED. MOHLER

DICKINSON COLLEGE,

November 28, 1913

A SECOND OCCURRENCE OF ICHTHYOSAURIAN REMAINS IN THE BENTON CRETACEOUS

IN 1905¹ Dr. John C. Merriam announced the discovery of Ichthyosaur-like remains in the Benton of Wyoming. That it was not an accidental occurrence now appears to be indicated by the finding of a second specimen in these same beds. Recently I have received for examination a single badly worn vertebral centrum, collected during the summer of 1913 by Mr. C. J. Hares, of the U. S. Geological Survey in the Mowrey shales, some 12 miles west of Casper, Wyoming. This vertebra is of the typical biconcave ichthyosaurian type and in its present condition is indistinguishable from those of *Baptanodon*. The fragmentary nature of the specimen precludes the possibility of determining its true generic affinities, but as recording a second occurrence of ichthyosaur-like remains in the Benton, the specimen is at the least of interest.

CHARLES W. GILMORE

U. S. NATIONAL MUSEUM

A MISNAMED PORTRAIT OF JOHN SHAW BILLINGS

TO THE EDITOR OF SCIENCE: Dr. S. Weir Mitchell's appreciative memoir of the late Dr. Billings in your current issue is not accompanied by a picture and does not refer to one; so the present note may be acceptable. On p. 223 of Vol. VII. of the "Photographic History of the Civil War" the upper right portrait represents Dr. Billings during the war as an assistant surgeon with the rank of first lieutenant; it is misnamed "Brevet Lieut. Col. J. J. Woodward." This legend really belongs to the lower left portrait, which in turn is misnamed "Brevet Major C. B. Greenleaf." To which of the two other portraits this belongs I can not say. In this connection may be noted another error in the work above named. In Vol. X., on p. 263, the portrait named "David R. Jones" is that of Samuel

¹ SCIENCE, N. S., Vol. XXII., No. 568, pp. 640-641.

Jones, identical with that in his book, "The Siege of Charleston." BURT G. WILDER
BROOKLINE, MASS., December 12, 1913

SCIENTIFIC BOOKS

Researches in Magneto-Optics, With Special Reference to the Magnetic Resolution of Spectrum Lines. By P. ZEEMAN. (Macmillan's Science Monographs.) London: Macmillan and Co., Ltd. 1913. Pp. xvi + 219 + viii plates.

Since the discovery by Zeeman in 1896 of the resolution of spectrum lines in the magnetic field, works have appeared at intervals which summarized the development of the subject to the date of publication. Each of these has been needed when it appeared, partly by reason of differences in treatment by the several authors, but chiefly because of the continuous output of new matter, both on the experimental and theoretical sides; so that an author, by the time his book was off the press, would welcome an opportunity to add numerous footnotes or an extensive appendix.

The investigation of the Zeeman effect during these seventeen years impresses one as having been very ably conducted. The immediate development of the elementary theory by Lorentz gave the phenomenon the place in relation to the theories of light and of electricity which it has ever since maintained. Although the demands on instrumental equipment are severe, the rich field and the close connection with theory caused investigations to be taken up in many laboratories and the requirements have greatly stimulated the development of optical methods. In some cases, theory has predicted a result which at once appeared when the experiment was tried. On the other hand, if one compares the original explanation of the normal triplet with the involved mathematical treatments employed to account for the complex resolutions, the pressure exerted on the theorists by the laboratory results is quite apparent. The development of the theory, however, has been one of growth from a beginning still regarded as sound.

In the book under review, Professor Zeeman

has given us an account, simple in language, largely historical in arrangement, and occasionally touched with personal reminiscence, which records in a highly attractive manner the main features of the investigations started by his discovery. It is in keeping with the title and with the series of monographs to which this book belongs that the author devotes his closest analysis to those features of the phenomenon which have been studied in his own laboratory. This involves the correlation of his results with those of others on these subjects, but other important lines of investigation, such as the application to spectral series, are not omitted.

The first chapter is devoted to the instrumental means employed in the study of the Zeeman effect, especially as regards the efficiency of different spectrosopes in giving the high resolving power required. Emphasis is laid on the three requirements of great resolving power, high magnetic field-strength, and sharpness of spectrum lines for the best results in this work. At the close of the chapter we are reminded of what has occurred to many investigators, that we are near the limit of field strength to be obtained from an iron-cored magnet, and that the hope of great advance, both as to intensity and uniformity of field, lies in the use of a large solenoid. Although the construction of this would require a larger expenditure than has ever been devoted to a single line of physical research, the certainty of the results would seem to make the adoption of the method only a question of time.

The early investigations on emission spectra and the derivation of e/m from the separation of the normal triplet are treated in the second chapter, and the author passes next to the "inverse effect," or the magnetic resolution of absorption lines. This branch of the study must be regarded as still in a preliminary stage. A decided stimulus has been given to the examination of the inverse effect by the discovery of the magnetic field in sun-spots, and much important work, described in a later chapter, has been done by Zeeman himself. The methods are quite different from

those employed with emission spectra and the difficulties arise from peculiar causes. The close analogy of the effects with those of bright line spectra is well worked out, however, and we must admire the skill shown in tracing out the action of polarization of the white light and varying density of the absorbing vapor in altering the effects.

In the following chapters, several branches of investigation of the Zeeman effect are considered in turn. A short account is also given of the related phenomena of magnetic rotation in vapors and magnetic double refraction. The study of multiple resolutions is traced, from the observation that all lines are not normal triplets to the profoundly significant relation of the commensurability of the components given by Runge. Dissymmetries in the resolution and a shift of the middle component are features of the later study which are reviewed by Zeeman.

A chapter on solar magneto-optics summarizes the results of the study of the magnetic field of sun-spots by Hale and of his first observations on the general field of the sun. This is followed by a chapter describing the important experiments of Zeeman and Winawer on the inverse effect in directions inclined to the field. Undertaken because of its application to the solar magnetic effects, this work has been carried out with the highest skill and resourcefulness. Results have been obtained which undoubtedly bear closely on the solar phenomena and can be applied when sun-spots are again in evidence.

The closing chapter of the monograph, on the relation between magnetic resolution and the chemical nature of the elements, may be characterized as a statement of unsolved problems. In it we are made to feel how young the subject of magneto-optics is, and that in some directions the considerable mass of experimental material has served to show that a connection with other departments of knowledge exists but leaves the nature of the relation highly obscure. Thus, the relation between magnetic resolution and arrangement of the lines in series is clear only for a few elements having low atomic weights and few

lines in their spectra. The fact that a series line which is double with no field may change to a simple triplet in the field is an anomaly which affects the whole question of the connection with series relations. There is probably a fundamental relation between magnetic resolution and the pressure effect, but no close correspondence in detail.

A summary of the leading features of several atomic theories and a highly useful bibliography, giving the entire literature arranged according to year of publication, close a volume which will be appreciated by every student of the subject.

ARTHUR S. KING
MT. WILSON SOLAR OBSERVATORY

Mountains, their Origin, Growth and Decay.
By JAMES GEIKIE, LL.D., F.R.S., etc.
Edinburgh, Oliver and Boyd. 1913. Pp.
311, 80 Pl., 57 Figs. in text.

This volume contains in systematic form the substance of various contributions made by Professor Geikie during the last twenty years, supplemented with much new matter. The author recognizes two classes of mountains, original or tectonic, and subsequent or relict.

Tectonic mountains are due to accumulation or deformation; the former includes the various types of volcanoes as well as glacial and æolian hills; all of which grow by additions to the outside; the latter includes folded, dislocation and laccolith forms, all due to crustal disturbance. The study of tectonic mountains occupies by far the greater part of the work, which is intended to be a non-technical presentation of the subject. Such matters as glacial action, metamorphism, types and causes of folding, structure of the Alps, origin of ocean "deeps" are discussed as simply and easily as though they were familiar topics of every-day conversation. Certainly, this mode of treatment shows that exact scientific method does not require much aside from ordinary language, for one knowing only the general principles of physics and geology can grasp the situation so as to appreciate the difficulties with which an investigator must contend as

well as the great opportunity for erroneous conclusions. The geologist, finding the statements exact, can not complain because the presentation is such as to be attractive to the layman. Subsequent mountains, being merely relics of former highland, receive briefer treatment, and the discussion is confined chiefly to consideration of the various destructive agencies and their action upon the rocks and types of structure.

As one should expect in a work intended mostly for "home consumption," full share of the space is given to such Scottish and English areas as afford proper illustrations; but in this, as in earlier works by Professor Geikie, there is ample evidence of intimate acquaintance with conditions elsewhere, and he has levied contributions upon all parts of the world. The plates, reproductions of photographs from many lands, are of unusual excellence and the text is full of suggestive matter for the geologist in every land.

Some portions of the work are deliciously controversial; the consideration of phenomena in the Pacific basin is thorough and the argument against explanations offered by Suess is put very strongly; some American geologists will regard the opinions respecting isostacy as not altogether orthodox, and several continental geologists will feel convinced that the author does not know so much about Alpine structure as they do. But all, whether accepting or opposing his conclusions, will agree that the tone of his presentation is judicial throughout, as benefits one who has made direct study in a great part of Europe and whose familiarity with the literature is equalled by that of few other geologists.

JOHN J. STEVENSON

The Indigenous Trees of the Hawaiian Islands. By JOSEPH F. ROCK, botanist of the College of Hawaii; consulting botanist, Board of Commissioners of Agriculture and Forestry, Territory of Hawaii. Issued June 26, 1913. With two hundred and fifteen photo-engravings. Published under patronage, Honolulu, T. H. 1913. Large octavo. Pp. viii + 518.

This stately volume includes descriptions of two hundred and twenty-five species of trees which are natives of the Hawaiian Islands. The author tells us in his preface that it had "long been the writer's desire to give to the public a volume on the native trees of Hawaii," so that this work is the result of a protracted study of the interesting vegetation of these isolated islands, and as a consequence is much more authoritative and complete.

The introduction, of 87 pages, gives "a more or less detailed description of all the floral regions, and their plant associations found in this island group, not being restricted to trees alone, but embracing the whole plant covering." In it we are first given a tabular enumeration of the botanical regions, as follows:

1. Strand vegetation.
2. Lowland region (merging into 3).
 - (a) Dry region.
 - (b) Wet region.
3. Lower forest region.
 - (a) Windward side.
 - (b) Leeward side.
4. Middle forest region.
 - (a) Dry region.
 - (b) Semi-dry region.
 - (c) Wet region.
 - (d) *Kipukas* (small areas of black, fertile soil in dry regions with no trace of lava, richest in species).
5. Bog region.
6. Upper forest region.

These are described at some length, and are illustrated by many good photo-engravings. On the largest of the islands (Hawaii) the mountains reach elevations of 8,273 feet, 13,675 feet and 13,823 feet, so that there are wide climatic ranges from tropical heat to "almost perpetual snow." Indeed the author sums up his statement in the sentence, "from a phytogeographic standpoint the island of Hawaii offers the most interesting field in the Pacific."

Coming now to the systematic part of the book one finds that no less than forty-five families of plants are represented by species of trees. And yet with all the variety that this implies there is scarcely a familiar genus in

the whole book. There are two tree ferns, of the genus *Cibotium*, one (*C. menziesii*) reaches a total height of 26 feet and its stem often has a diameter of three feet. Monocotyledons are represented by a *Pandanus*, eleven palms (*Pritchardi* and *Cocos*) and a *Dracaena*. In the Dicotyledons one finds many unfamiliar genera in familiar families: as *Trema* (Ulmaceae), *Urera* and *Pipturus* (Urticaceae), *Notothrichium* and *Charpentiera* (Amaranthaceae), *Broussaisia* (Saxifragaceae), *Colubrina* (Rhamnaceae), *Jambosa*, *Syzygium*, and *Metrosideros* (Myrtaceae), *Pteralyxia*, *Ochrosia* and *Rauwolfia* (Apocynaceae), *Clermontia* and *Cyanea* (Campanulaceae), *Dubautia*, *Railardia*, and *Hesperomannia* (Compositæ). On the other hand one finds, also, *Artocarpus* (Moraceae) the well-known "Breadfruit tree"; *Pittosporum* (Pittosporaceae), of which there are twelve species, several of which are more than twenty feet high; *Acacia* and *Sophora* (Leguminosæ); *Xanthoxylum* (Rutaceae); *Euphorbia* (Euphorbiaceae), two species of trees from 15 to 25 feet in height; *Rhus* (Anacardiaceae); *Ilex* (Aquifoliaceae), one tree of 20 to 40 feet in height; *Hibiscus* (Malvaceae), including trees 20 to 30 feet in height; *Sideroxylon* (Sapotaceae), some 50 to 60 feet high; *Osmanthus* (Oleaceae), sixty feet high; *Solanum* (Solanaceae) a small tree, 15 to 20 feet high. Many of the trees bear foliage of such a structure as to hide completely their botanical relationship.

Among the notable trees is the koa (*Acacia koa*), "one of our most stately trees." "It is perhaps the most valuable tree which the islands possess, as it is adapted for construction as well as for cabinet work. The koa reaches a height of more than 80 feet in certain localities, with a large trunk vested in a rough, scaly bark of nearly an inch in thickness." Another tree (*Pisonia umbellifera*) possesses so soft a stem that "trunks of a foot in diameter can be felled with one stroke of the axe."

The largest family, so far as the tree species are concerned, is Rutaceae (32 sp.), followed closely by Rubiaceae (31 sp.), and then Campanulaceae (15), Araliaceae (14),

Pittosporaceae (12), Palmaceae (11), Myrsinaceae (11), and Malvaceae (10).

At the end of the volume there is a good index to the scientific names, followed by one of the Hawaiian and few English names.

CHARLES E. BESSEY
THE UNIVERSITY OF NEBRASKA

Science from an Easy Chair. Second series.
By SIR RAY LANKESTER. New York, Henry Holt and Company. 1913. Pp. 412.

In his chapter on Museums, Sir Ray Lankester deplores the fact that so many are "mere enlargements of the ancient collector's 'cabinet of rare and curious things,' brought together and arranged without rhyme or reason." His book, dealing in one small volume with such diverse matters as Kisses, Ferns, Glaciers, Elephants and Tadpoles, might possibly be described in similar terms; yet it is by no means without merit. It is a significant and interesting fact that a zoologist of the first rank, retiring from the directorship of the British Natural History Museum, should think it worth his while to contribute weekly articles on scientific subjects to a daily paper, regularly for a period of five years. It is no less significant that this paper (the *Daily Telegraph*) should be willing to print them as they stand, popular in form, but dealing in many cases with technical matters which require close attention in order to be understood. The book before us consists of a selection from this newspaper series, with some revision and expansion, and a number of illustrations. It possesses the original journalistic tone, and consists essentially of well-written dissertations on matters familiar to specialists, but, for the most part, new to the general public. I have read the greater part of it with pleasure and interest, and, while different chapters will appeal to different people, few can fail to find something of value. Some of the essays, as those on Food and Cookery and Misconceptions about Science, reflect so strongly the author's prepossessions that they naturally arouse a combative spirit in those of a different temper. Here and there, expressions have crept in which the author would scarcely de-

fend in cold blood; thus (p. 19) "even the destructive bacteria which are killed by the sun probably enjoy an exquisite shudder in the process which more than compensates them for their extinction"; and (p. 344) "every step which he [the house-fly] takes he plants a few dozen microbes, which include those of infantile diarrhoea, typhoid and other prevalent diseases,"—a gross exaggeration in a chapter which very properly calls attention to the great harm done by flies as carriers of bacteria.

The time has certainly come for scientific men in America to attack the problem of scientific journalism in an organized and deliberate manner. The individual naturalist is more or less helpless. When I was curator of the museum in Jamaica I contributed weekly articles to the newspapers of Kingston, which printed them as written, and even illustrated them when requested. These articles interested a good many people and were the cause of many visits and contributions to the museum. In Colorado I have tried the same thing, and given it up in despair. The papers will not print things accurately or in full, and will often supply headlines of the most ridiculous kind. Here is a typical incident. A friend of mine shot a large eagle and measured it from tip to tip of the wings. Thinking the matter of interest, he handed in the item to a daily paper. The editor, with the best of intentions in the world, added a foot to the measurement, with the result that my friend appeared to those who knew anything of eagles a remarkable liar! These troubles are not confined to the wild and woolly west. Even the *Outlook*, certainly one of our best-edited journals, recently published an article on A. R. Wallace which contained in the first column a number of errors concerning the best-known facts of his life.

It is not true, of course, that the newspapers *always* select incompetent writers on scientific subjects, or *always* distort accurate information communicated to them; but if they are to be the means of enlightening the public concerning the discoveries of science, they must *never* do these things, except

through such unfortunate accidents as can not perhaps wholly be avoided. One can not write to the papers if the chances are one in five or ten that one will be exhibited as a fool or liar, and the public misled as to the facts.

T. D. A. COCKERELL

SPECIAL ARTICLES

A NOTE ON SEX DETERMINATION¹

OF the many hypotheses that have been advanced to explain the determination of sex, one group seeks to show that in bilateral animals the sex of the offspring is dependent upon the right or left source of the effective genital element in that right glands produce offspring of one sex, left glands those of the other. Such a general theory may be applied, of course, to either the ovary or the testis. Thus Seligson (1895)² formulated the hypothesis that in mammals the right ovary gives rise to eggs that produce male offspring, the left to eggs that produce female offspring.

In collecting a body of data to show the relation of the size of litters to the number of nipples in swine (Parker and Bullard, 1913),³ certain facts appeared which have a bearing on such hypotheses. The records brought together in this connection included the position that the young pigs occupied in the uterus and their sex. In reasonably large litters it was therefore possible to make a rough comparison of the products of one ovary with those of the other by contrasting the young pigs in one horn of the uterus with those in the other. The possibility of the migration of an egg from one side of the body to the other could not be excluded, but to reduce to a minimum the effect of this on the statistics and to make the comparison as striking as possible, the

¹ Contributions from the Zoological Laboratory of the Museum of Comparative Zoology at Harvard College, No. 245.

² Seligson, E., "Zur Bestimmung und Entstehung des Geschlechts," *Centralbl. für Gynäkol.*, Bd. 19, pp. 590-595, 1895.

³ Parker, G. H., and C. Bullard, "On the Size of Litters and the Number of Nipples in Swine," *Proceed. Amer. Acad. Arts and Sci.*, Vol. 49, pp. 397-426, 1913.

whole contents of horns were not compared, but the pairs of animals next the right and the left ovaries were contrasted, so far as their sexes were concerned, with the pairs at the juncture of the horns, the presumption being that the pure products of each ovary would occur most frequently next that organ and the mixed products of the two ovaries midway between them. The details thus brought together are shown in the following table.

TABLE

This table shows the frequency of occurrence of pairs of unborn pigs of various combinations of sexes at the division of the horns of the uterus, next the right ovary, and next the left ovary.

Composition of Pairs		$\sigma \sigma$	$\varphi \varphi$	$\sigma \varphi$
Observed frequencies	At division of horns	252	240	456
	Next right ovary	228	209	434
	Next left ovary	216	208	447
Percentage frequencies	At division of horns	26.6 — 25.3 +	48.1 +	
	Next right ovary	26.2 — 24.0 —	49.8 +	
	Next left ovary	24.8 — 23.9 —	51.3 +	

It is fair to assume that at the division of the horns of the uterus the offspring are likely to be as often from one ovary as from the other. If in the whole population the males and females are equally abundant, three classes of pairs would be expected to occur and in the following proportions: 25 per cent. of the pairs would be composed of two males; 25 per cent. of two females; and 50 per cent. each of a male and a female. That this condition is very nearly realized is seen from the table, where it will be observed that the pairs of males are present to the extent of 26.6 — per cent., the females 25.3 + per cent. and the pairs of the two sexes combined 48.1 + per cent. The fact that the table shows a few more pairs of males than females is due to the condition of the population as a whole, in which the males outnumber the females by 1,026 to 1,000. This slight digression from equality also has its effect on the relation of the numbers of pairs composed of both sexes to those of one sex only, but the total number of records is probably too small to yield very smooth results in this respect.

If, as Seligson maintained, the right ovary gives rise to male and the left to female offspring, the pairs of pigs next the right ovary ought to be predominantly males and those next the left predominantly females. That such is not the case is seen at once from the table, where it is shown that pairs composed of two males or of two females occur in about the same proportions next the right ovary that they do next the left, a proportion that is very close to that occurring at the division of the horns of the uterus. These statistics, therefore, give no support to hypotheses, such as Seligson's, according to which the eggs from the ovary of one side of the body produce offspring of one sex only.

Although the sex of the offspring is thus shown not to be correlated with the side of the body from which the egg that gave rise to the young came, it might be supposed that in any female a given ovary would always produce offspring of the same sex. In that case we should expect to find the great majority of pairs of young next the ovaries to be either both males or both females. But, as the table shows, there are almost as many pairs composed of one male and one female next the ovaries as there are at the division of the horns. Hence we may conclude that in the pig the ovaries by virtue of their position in one or other half of the maternal body exert no influence on the sex of the offspring, but that each ovary produces eggs which may give rise to either male or female offspring. This conclusion is in line with such experimental work as that of Doncaster and Marshall (1910),⁴ and of King (1911)⁵ on albino rats, according to which a single ovary, after the removal of its mate, can give rise to eggs which produce males and females.

G. H. PARKER

January 23, 1914

⁴ Doncaster, L., and F. H. A. Marshall, "The Effects of One-sided Ovariectomy on the Sex of the Offspring," *Jour. Genetics*, Vol. 1, pp. 70-72, 1910.

⁵ King, H. D., "The Effects of Semi-spaying and Semi-castration on the Sex Ratio of the Albino Rat (*Mus norvegicus albinus*)," *Jour. Exp. Zool.*, Vol. 10, pp. 381-392, 1911.

THE FEDERATION OF AMERICAN SOCIETIES FOR EXPERIMENTAL BIOLOGY

FOR a number of years the members of the Physiological, the Biochemical and the Pharmacological Societies have felt the desirability of a closer cooperation of these and other biological societies, especially as regards the annual scientific meetings. At the meeting in Chicago in 1907 the Physiological Society appointed a committee on policy with instructions to report at the next annual meeting. At the meeting in Baltimore in 1908 the chairman of this committee, Dr. A. P. Mathews, presented a plan for reorganizing all the present biological societies into a general Biological Society. The plan involved a change in policy and in the character of the membership of at least some of the societies, and an extensive venture in the publication of scientific journals. These features were not endorsed by the society, but the general plan of affiliation of all the biological societies was favorably received and Dr. Mathews was appointed delegate from the Physiological Society to confer with delegates from the other biological societies to this end. This committee does not appear to have made any progress.

At the meeting in Cleveland in 1912, the Physiological, Biochemical and Pharmacological Societies appointed committees to propose plans for affiliation. The committee consisted of Drs. Meltzer, Lee and Cannon from the Physiological Society, Drs. Lusk, Gies and Wells from the Biochemical Society and Drs. Sollmann, Loevenhart and Auer, from the Pharmacological Society. This committee submitted the following plan:

1. That the three societies affiliate under the name of the Federation of American Societies for Experimental Biology.
2. That the presidents and secretaries of the three societies constitute the executive committee of the federation.
3. That programs of the annual meetings be printed under one cover, and that the secretaries confer and adjust the papers with the view of the greatest coordination.
4. That a common meeting place of the federation with the anatomists, zoologists and naturalists is desirable.

The annual meeting in Philadelphia, December 28-31, 1913, was arranged by the executive committee of the federation according to the above plan. Those present at the meeting were in substantial agreement that it was a success. At this

meeting the plan of the organization committee was ratified by the three societies and the Society for Experimental Pathology joined the federation. This brings the total membership of the federation up to about 450.

The distinctive feature of the federation plan is the cooperation and coordination in the essential things, with no interference with the individuality of the societies. This cooperation is certainly desirable between all the biological societies, and we believe the federation plan can and ought to be extended in that direction. We believe it will increase the efficiency of the societies as agencies for the promotion of research and dissemination of truth.

At the first executive meeting of the federation, December 31, 1913, the following declaration on the subject of animal experimentation was unanimously adopted:

1. We, the members of the Federation of American Societies for Experimental Biology—comprising the American Physiological Society, the American Society of Biological Chemists, the American Society for Pharmacology and Experimental Therapeutics and the American Society for Experimental Pathology,—in convention assembled, hereby express our accord with the declaration of the recent International Medical Congress and other authoritative medical organizations, in favor of the scientific method designated properly animal experimentation but sometimes vivisection.

2. We point to the remarkable and innumerable achievements by means of animal experimentation in the past in advancing the knowledge of biological laws and devising methods of procedure for the cure of disease and for the prevention of suffering in human beings and lower animals. We emphasize the necessity of animal experimentation in continuing similar beneficent work in the future.

3. We are firmly opposed to cruelty to animals. We heartily support all humane efforts to prevent the wanton infliction of pain. The vast majority of experiments on animals need not be and, in fact, are not accompanied by any pain whatsoever. Under the regulations already in force, which reduce discomfort to the least possible amount and which require the decision of doubtful cases by the responsible laboratory director, the performance of those rare experiments which involve pain is, we believe, justifiable.

4. We regret the widespread lack of informa-

tion regarding the aims, the achievements and procedures of animal experimentation. We deplore the persistent misrepresentation of these aims, achievements and procedures by those who are opposed to this scientific method. We protest against the frequent denunciations of self-sacrificing, high-minded men of science who are devoting their lives to the welfare of mankind in efforts to solve the complicated problems of living beings and their diseases.

Executive Committee of the Federation for the Year 1914.—W. B. Cannon, A. J. Carlson, the Physiological Society; G. Lusk, P. A. Shaffer, the Biochemical Society; T. Sollmann, J. Auer, the Pharmacological Society; R. M. Pearce, G. H. Whipple, the Pathological Society; G. Lusk, *Chairman*; P. A. Shaffer, *Secretary*.

A. J. CARLSON,

Secretary of the Executive Committee, 1913
UNIVERSITY OF CHICAGO,
January 10, 1914

THE AMERICAN SOCIETY OF BIOLOGICAL CHEMISTS

THE eighth annual meeting of the American Society of Biological Chemists was held at Philadelphia on December 29, 30, 31, 1913, in affiliation with the American Physiological Society and the American Society for Pharmacology and Experimental Therapeutics, as the first meeting of the Federation of American Societies for Experimental Biology. The meetings of the society were well attended and highly successful. The joint meetings, as in past years, were of great interest to the members of all of the societies, and these, together with the cooperation in the arrangement and printing of programs, emphasized the advantages of the closer relations between the societies made permanent by the formation of the federation. The scientific programs are appended.

First Session.—December 29, 9 A.M., at the Jefferson Medical College. Joint session with the American Physiological Society and the American Society for Pharmacology and Experimental Therapeutics, as the first session of the federation. Presiding officer, S. J. Meltzer, president of the American Physiological Society and chairman of the federation.

Presidential address, "Theories of Anesthesia," by S. J. Meltzer.

"Phlorhizin Glycosuria before and after Thyroidectomy," by Graham Lusk.

"Studies in Diabetes: (1) The Effect of Different Compounds on Glycogenesis"; (2) "The Mechanism of Antiketogenesis," by A. I. Ringer and E. M. Frankel (by invitation).

"Some Problems of Growth: (a) The Capacity to Grow; (b) The Rôle of Amino Acids in Growth," by L. B. Mendel and T. B. Osborne.

"Further Studies in the Comparative Biochemistry of Purine Metabolism," by Andrew Hunter.

"Changes in Fats during Absorption," by W. R. Bloor.

"Immunization against the Anti-coagulating Effect of Leech Extract," by Leo Loeb. (By title.)

"Anaphylaxis in the Cat and Opossum," by C. W. Edmunds.

"Vividiffusion; Report on Preliminary Results," by J. J. Abel, L. G. Rowntree and B. B. Turner.

"A Method of Dialyzing Normal Circulating Blood and Some of Its Applications," by C. L. V. Hess (by invitation) and H. McGuigan.

"A Biological Test for Iodine in the Blood," by A. Woelfel and A. L. Tatum (by invitation).

"Further Studies of the Excretion of Acids," by L. G. Henderson and W. W. Palmer (by invitation).

Second Session.—December 29, 2:30 P.M. at the Jefferson Medical College. Presiding officer, President A. B. Macallum.

Presidential address, "The Physics of Secretion and Excretion," by A. B. Macallum.

"The So-called Vegetable Proteoses and their Biological Reactions," by H. G. Wells and T. B. Osborne.

"Some Anaphylactic Reactions," by H. C. Bradley.

"The Mode of Action of Soy Bean Urease," by D. D. Van Slyke and Glen E. Cullen (by invitation).

"Glycol Aldehyde in Phlorhized Dogs," by R. T. Woodyatt. (By title.)

"Trikresol as a Substitute for Toluene in Enzyme Work," by P. A. Kober and S. S. Graves (by invitation).

"A Study of the Metabolism in Osteitis Deformans," by J. C. DaCosta, E. H. Funk, Olaf Bergeim (by invitation) and P. B. Hawk.

"Metabolism in Diabetes Insipidus," by S. Bookman. (By title.)

"Some Metabolic Effects of Bathing in the Great Salt Lake," by H. I. Mattill (by invitation) and H. A. Mattill. (By title.)

"Absorption of Antitoxin from Solutions Containing Different Percentages of Protein,"¹ by W. H. Park, E. J. Banzhaf and L. W. Famulener.

Third Session.—December 30, 9 A.M., at the University of Pennsylvania. Presiding officer, President A. B. Macallum.

"The Carbohydrate Tolerance of Feeble-minded Children, especially of the Mongolian Type," by A. W. Peters and M. E. Turnbull (by invitation).

¹ Transferred from the Pharmacological Society.

"Protein Metabolism in Individuals with Exfoliative Conditions of the Skin," by A. I. Ringer and G. W. Raiziss (by invitation).

"The Oxygen Requirements of Shell Fish," by P. H. Mitchell.

"The Metabolic Relationship of the Acetone Bodies," by W. McK. Marriott.

"Phenomena of Narcosis of Leaves of the Wild Indigo (*Baptisia tinctoria*) and Consequent Production of a New Phenol," by E. D. Clark. (By title.)

"A Hitherto Unknown Constituent of Nerve Cells," by A. B. Macallum and J. B. Collip (by invitation).

"A Note on the Chemical Constituents of the Cerebrospinal Fluid in Certain Cases of Insanity," by H. M. Adler and B. H. Ragle (by invitation). (By title.)

"On the Estimation of Minute Quantities of Phosphorus," by A. E. Taylor and C. W. Miller (by invitation).

"Formation of Glucose from Citric Acid in Diabetes Mellitus and in Phlorhizin Glycosuria," by I. Greenwald.

"Further Results upon the Electrolysis of Peptides and Amino Acids," by J. P. Atkinson. (By title.)

"Researches on the Heptoses," by George Peirce (by invitation).

"The Nerve Control of the Thyroid Gland," by C. G. Fawcett (by invitation) and J. A. Rahe (by invitation). (Presented by S. P. Beebe.)

Fourth Session.—December 30, 2 P.M., at the medical laboratory of the University of Pennsylvania. Joint meeting with the American Physiological Society and the American Society of Pharmacology and Experimental Therapeutics. Presiding officer, President S. J. Meltzer.

Presentation of Demonstrations

The Influence of the Vagi on Renal Secretion, by R. G. Pearce.

Stimulation of the Semi-circular Canals, by F. H. Pike.

Demonstration of Vividiffusion, by J. J. Abel, L. G. Rowntree and B. B. Turner.

The Determination of Blood Sugar, by P. A. Shaffer.

Intestinal Peristalsis in Homarus, by F. R. Miller.

Methods for Studying the Pharmacology of the Circulation, by C. Brooks.

The Contour of the Intraventricular and the Pulmonary Arterial Pressure Curves by Two New Optically Recording Manometers, by C. J. Wiggers.

Some Time-saving Laboratory Methods, by C. C. Guthrie.

A Graphic Method for Recording the Coagulation of Blood, by W. B. Cannon and W. L. Mendenhall (by invitation).

Some Mutual Relations of Oxalates, Salts of Magnesium and Calcium; Their Concurrent and Antagonistic Actions, by F. L. Gates and S. J. Meltzer.

A Method of obtaining Successive Contrast of the Sensations of Hunger and Appetite, by A. J. Carlson.

Further Observations on the Pyramidal Tracts of the Raccoon and Porcupine, by S. Simpson.

A New Apparatus for Demonstration of the Dioptrics of the Eye and the Principles of Ophthalmoscopy and Retinoscopy, by A. Woelfel.

Simple Experiments on Respiration for the Use of Students, by Y. Henderson.

Convenient Modification for Venous Pressure Determinations in Man, by R. D. Hooker.

Device for Interrupting a Continuous Blast of Air, Designed Especially for Artificial Respiration, by R. A. Gesell and J. Erlanger.

A Simple Liver Plethysmograph, by C. W. Edmunds.

An Artificial Circulation Apparatus for Students, by W. P. Lombard.

A Simplified and Inexpensive Oxadase Apparatus, by H. H. Bunzel.

An Improved Form of Apparatus for Perfusion of the Excised Mammalian Heart, by M. Dessbach.

Fifth Session.—December 31, 9 A.M., at the University of Pennsylvania. Presiding officer, President A. B. Macallum.

"Biological Oxidizability and Chemical Constitution," by H. H. Bunzel.

"Albuminuria Following Phenolphthalein Ingestion," by J. L. Hydrich (by invitation).

"The Determination of Fats in Small Amounts of Blood," by W. R. Bloor.

"Creatine Determination in Muscle," by L. Baumann.

"A Respiration Chamber for Small Animals," by A. C. Kolls (by invitation) and A. S. Loewenthal.

"A Respiration Incubator for the Study of Metabolism in New-born and Prematurely Born Infants," by J. R. Murlin.

"The Specific Rôle of Foods in Relation to the Composition of the Urine," by N. R. Blatherwick (by invitation).

"Creatinine- and Creatine-free Foods," by Rita K. Chestnut (by invitation). (Presented by A. B. Macallum.)

"Experimental Hydrochloric Acid Intoxication," by S. Bookman. (By title.)

"The Effects of Water-gas Tar on Oysters," by P. H. Mitchell. (By title.)

"The Effect of Glucose on Autolysis: A Possible Explanation of the Protein-sparing Action of Carbohydrates" (preliminary note), by P. A. Shaffer.

"The Passage of Organic Substances from Plant to Medium," by M. X. Sullivan. (By title.)

"Studies on Chicken Fat VI. The Factors Influencing the Acidity of the Crude Fat," by M. E. Pennington, J. S. Hepburn (by invitation) and E. L. Connolly (by invitation).

By Title:

"The Influence of Restricted Rations on Growth," by E. B. Hart and E. V. McCollum.

"Production of Ammonia by Herbivora as a Protection Against Acidosis," by E. B. Hart and E. V. Nelson (by invitation).

"The Influence of Restricted Rations on Reproduction," by E. B. Hart, E. V. McCollum and H. Steenbock.

"Further Studies on the Quantitative Chemical Composition of Urinary Calculi," by J. Rosenbloom.

"On the Quantitative Chemical Composition of Gall Stones," by J. Rosenbloom.

"Metabolism Studies in a Case of Family Periodic Paralysis," by J. Rosenbloom and T. Diller (by invitation).

"Calcium Metabolism in Thyroparathyroidectomy," by F. T. Stewart (by invitation), Olaf Bergeim (by invitation), and P. B. Hawk.

"Variations in the Hydrogen Ion Concentration of the Urine of Man Accompanying Fasting and the Low and High Protein Regeneration Periods," by P. E. Howe and P. B. Hawk.

The following papers submitted in the American Society of Biological Chemists were transferred with the authors' consent and in accordance with the principles of the Federation, to the program of one of the other societies:

Presented before the American Physiological Society:

"The Maximum Surface Tension in Striated Muscle," by W. N. Berg. (By title.)

"Sources of Surface Tension in Striated Muscle," by W. N. Berg.

"Transfusion of Blood in Severe Diabetes Mellitus," by R. T. Woodyatt and B. O. Raulston (by invitation).

Presented before the American Society for Pharmacology and Experimental Therapeutics:

"The Production of Glycosuria by Zinc Salts," by W. Salant and M. Kahn.

"Further Observations of Caffeine Glycosuria," by W. Salant and M. Kahn.

"Studies Upon the Long-continued Feeding of Saponine," by C. L. Alsberg and C. S. Smith.

New Members.—Dr. Shiro Tashiro, University of Chicago, Chicago, Ill.; Dr. E. K. Marshall, Jr., Johns Hopkins Medical School, Baltimore, Md.; Professor R. S. Lillie, Clark University, Worcester, Mass.; Dr. K. G. Falk, Harriman Research Laboratory, Roosevelt Hospital, New York; Dr. F. C. Cook, Bureau of Chemistry, Department of Agriculture, Washington, D. C.; Dr. W. H. Eddy, Columbia University, New York; Professor R. F. Ruttan, McGill University, Montreal, Canada; Dr. H. B. Lewis, University of Pennsylvania, Philadelphia, Pa.; Dr. C. J. West, Rockefeller Institute, New York; Dr. E. C. Kendall, St. Luke's Hospital, New York; Dr. G. W. Raiziss, Polyclinic Hospital, 1818 Lombard Street, Philadelphia Pa.; Professor A. D. Hirschfelder, University of Minnesota, Minneapolis, Minn.

Officers Elected.—The following officers were elected for the year 1914:

President: Graham Lusk.

Vice-president: C. L. Alsberg.

Secretary: P. A. Shaffer.

Treasurer: D. D. Van Slyke.

Additional Members of the Council: J. J. Abel, A. B. Macallum, T. B. Osborne.

Nominating Committee.—S. R. Benedict, H. S. Bradley, Otto Folin, W. J. Gies, J. H. Kastle, J. B. Leathes, P. A. Levene, L. B. Mendel, H. G. Wells.

The society voted its formal approval of the establishment of the Federation of American Societies for Experimental Biology, comprising the American Physiological Society, American Society of Biological Chemists and the American Society for Pharmacology and Experimental Therapeutics. The society also voted in favor of admitting to the federation the newly organized American Society for Experimental Pathology.

A unanimous vote of thanks was extended by the society to the individual members of the "local committee," to the University of Pennsylvania and to the Jefferson Medical College for the hospitality which the society enjoyed.

The following members were present at one or more of the sessions of the meetings: J. J. Abel, C. L. Alsberg, S. Amberg, L. Baumann, S. P. Beebe, W. N. Berg, W. R. Bloor, H. C. Bradley, H. H. Bunzel, R. Burton-Opitz, E. D. Clark, F. C. Cook, H. D. Dakin, Willey Denis, W. H. Eddy, Otto Folin, W. J. Gies, I. Greenwald, Shinkishi Hatai, R. A. Hatcher, P. B. Hawk, L. J. Henderson, P. E. Howe, W. H. Howell, R. Hunt, A. Hunter, N. W. Janney, W. Jones, I. S. Kleiner, P. A. Kober, J. B. Leathes, J. Loeb, A. S. Loevenhart, Graham Lusk, A. B. Macallum, J. J. Macleod, W. deB. Naclider, W. McK. Marriott, E. K. Marshall, J. Marshall, E. V. McCollum, F. H. McCrudden, H. McGuigan, L. B. Mendel, P. H. Mitchell, J. R. Murlin, V. C. Myers, T. B. Osborne, A. W. Peters, G. W. Raiziss, A. N. Richards, A. I. Ringer, E. W. Rockwood, L. G. Rowntree, Wm. Salant, F. H. Scott, P. A. Shaffer, T. Sollmann, Shiro Tashiro, A. E. Taylor, F. P. Underhill, D. D. Van Slyke, C. Voegtlind, G. B. Wallace, H. G. Wells, R. T. Woodyatt.

Abstracts of the papers will be published in the *Journal of Biological Chemistry*.

P. A. SHAFFER,
Secretary

WASHINGTON UNIVERSITY
MEDICAL SCHOOL,
ST. LOUIS, MISSOURI

THE AMERICAN ASSOCIATION OF ECONOMIC ENTOMOLOGISTS

THE 26th annual meeting of the association was held in the Atlanta Medical College, Atlanta, Ga., December 31, 1913, to January 2, 1914, under the presidency of Professor P. J. Parrott, Geneva, N. Y.

The report of the secretary showed that the association was making a healthy growth and that the *Journal of Economic Entomology* was gradually increasing in circulation and that its financial condition was satisfactory.

Prior to the meeting arrangements were made for the incorporation of the association. This was brought about and the association is now incorporated as a membership corporation under the laws of the District of Columbia.

During the meeting the association considered the possibility of securing the publication of a bibliography of economic entomology and a committee was appointed to take charge of assembling the references required, and to investigate the possibilities of publishing this useful work.

Thirty-four new members were elected to the association and the following officers were elected for the ensuing year:

President—Dr. H. T. Fernald, Amherst, Mass.

First Vice-president—Professor Glenn W. Herriek, Ithaca, N. Y.

Second Vice-president—Dr. W. E. Britton, New Haven, Conn.

Third Vice-president—Professor Wilmon Newell, College Station, Texas.

Secretary—A. F. Burgess, Melrose Highlands, Mass.

It was voted to hold the next meeting in conjunction with that of the American Association for the Advancement of Science at Philadelphia next December.

The section on apiary inspection met on January 1 at 10:30 A.M., and was presided over by Professor Wilmon Newell, College Station, Texas. In the absence of the secretary, Mr. N. E. Shaw, Columbus, Ohio, was elected to act as secretary. Several papers were presented and a general discussion followed concerning the apiary inspection work which is being carried on by the different states. At the close of the session the above-mentioned officers were elected for the ensuing year.

The section on horticultural inspection was presided over by Professor E. L. Worsham, Atlanta, Ga., and Professor J. G. Sanders, Madison, Wis., as secretary. The meeting was called to order at 1:30 P.M., January 1, and an adjourned meeting was held at 7 P.M. in the parlors of the Ansley Hotel. A full program of papers was presented at this meeting and many subjects of interest to horticultural inspectors were considered and discussed. One of the most important matters brought before the section was the consideration of a uniform

nursery inspection law and more definite standards for inspection of nursery stock, which passes into interstate commerce. The meeting adjourned at 8 P.M., and the following officers were elected to serve for the ensuing year: Dr. W. E. Britton, New Haven, Conn., *Chairman*; Professor J. G. Sanders, Madison, Wis., *Secretary*. At the close of this meeting all visiting entomologists were the guests of state entomologist Worsham and his assistants at a smoker which was held at the University Club. There was a large attendance and all those present united in extending their thanks to the hosts of the occasion.

The program of scientific papers was introduced by the address of President Parrott on "The Growth and Organization of Applied Entomology in United States." This was followed by a series of papers on the organization of various kinds of special entomological work which is being carried on in different sections of the country. On Thursday morning a number of papers were presented bearing on spraying with poisonous and contact insecticides; on fumigation and life history studies on a number of orchard and garden pests. At the afternoon session, papers were read on experimental work on a number of insects which are destructive to garden and field crops and forests, and several papers on insect parasitism were also presented.

At the closing session on Friday morning, January 2, a paper was presented by Dr. L. O. Howard on "The Education of the Entomologist in the Service of the United States Department of Agriculture," and this was followed by a number of interesting papers on mosquitoes and house flies, which took up observations on their habits and experiments bearing on their control.

All the papers presented at the meeting will be published in full in the *Journal of Economic Entomology*.

A. F. BURGESS,
Secretary

THE AMERICAN PHILOSOPHICAL ASSOCIATION

THE association at its annual meeting at New Haven, Conn., in December, elected the following officers:

President—Professor J. H. Tufts, of Chicago University.

Vice-president—Professor W. H. Sheldon, of Dartmouth College.

Secretary-treasurer—Professor E. G. Spaulding, of Princeton University.

New Members of the Executive Committee— Professors W. T. Bush, of Columbia University; I. W. Riley, of Vassar College, and C. M. Bakeswell, of Yale University.

The program was of exceptional interest this year, in that two days' sessions were devoted to the discussion of one subject, "The Problem of Values in its Various Aspects." Miscellaneous papers were read on this subject at the first day's sessions, and the entire second day was devoted to discussion. The leaders in this debate were Professor R. B. Perry, of Harvard University, and Professor W. H. Sheldon, of Dartmouth College. The association, on the whole, found this procedure more profitable than the usual short discussions of many miscellaneous papers. A joint discussion was also held with the American Psychological Association on "The Standpoint and Method of Psychology." Leaders in this discussion were Professor John Dewey, Professor F. M. Urban, Professor J. E. Creighton and Professor Hugo Münsterberg. The two associations participated in a joint dinner on December 30 at the Hotel Taft, and Professor Howard C. Warren, of Princeton University, president of the Psychological Association, read on this occasion an extremely interesting address on "The Physical and the Mental."

President McGilvary, of Wisconsin, addressed the two associations on December 29 on "Time and the Experience of Time."

E. G. SPAULDING,
Secretary

THE SOUTHERN SOCIETY FOR PHILOSOPHY AND PSYCHOLOGY

THE society held its ninth annual meeting at Atlanta, Ga., Wednesday, December 31, 1913, and Thursday, January 1, 1914, in affiliation with the American Association for the Advancement of Science. Fifteen of the fifty-six members were present. Three sessions were held, one on Wednesday forenoon in conjunction with Section H of the American Association for the Advancement of Science, one on Thursday forenoon, and one on Thursday afternoon in conjunction with Sections H and L. The meetings were held in the chemical lecture room of the Georgia School of Technology. On Wednesday evening the members of the society and of Sections H and L were entertained at a smoker at the University Club by Dr. H. J. Pearce, the president of the society. The president's address, entitled "The Limitations of

Knowledge," was given at 4:30 on Thursday afternoon.

The following items were passed upon at the business meeting held Thursday forenoon:

1. The place of holding the next meeting was left to the council for decision. Professor Ogden invited the society to come to Knoxville, but as the American Association for the Advancement of Science will meet at Philadelphia the suggestion was made that the society meet one day at Washington and then join some of the sections at Philadelphia.

2. The following officers were elected:

President—J. B. Watson, Johns Hopkins University.

Vice-president—Josiah Morse, University of South Carolina.

Secretary-treasurer—W. C. Ruediger (re-elected), The George Washington University.

Council for three years—E. F. Buchner (re-elected), Johns Hopkins University, and L. R. Geissler, University of Georgia; for two years J. C. Barnes, Maryville College; for one year W. H. Chase, University of North Carolina.

3. The following new members were elected: Dr. Edwina Abbott, Tulane University; Mrs. A. H. Arlitt, Tulane University; Dr. F. M. Barnes, St. Louis; David June Carver, Johns Hopkins University; Edward Conradi, Florida State College for Women; Dr. Harvey W. Cox, University of Florida; Professor Ezra B. Crooks, Randolph-Macon Woman's College; Miss Lucile Dooley, Knoxville, Tenn.; James Wallace Hopkins, Tulane University; Miss Marguerite Kehr, Knoxville, Tenn.; Professor Mark Edgar Sentelle, Davidson College; Dr. E. K. Strong, Jr., Columbia University.

4. The accounts of the treasurer, which were audited for the council by Professor Ogden and approved by the society, showed a balance on hand, December 31, 1913, of \$82.44. Of this \$15 was allowed the secretary toward defraying his expenses incident to the Atlanta meeting.

5. The secretary was authorized to frame an amendment to Section 1, Article III., of the constitution changing the term of office for the secretary-treasurer from one year to three years.

The following papers were read by members of the society either before sessions of the society alone or before joint sessions with Sections H and L.

"New Interpretations of Psychoanalytic Data," by Tom A. Williams.

"Correlation of Physical and Mental Measurements," by J. C. Barnes.

"Dreams as Retrogressive Interpretations," by W. B. Smith.

"The Master Motive in a Theory of Knowledge," by John G. Harrison.

"Rational Psychotherapy," by Robert S. Carroll.

"Concluding from Negatives," by W. B. Smith.

"Concerning the Psychological Origin of Creation Stories," by W. T. Shepherd. (By title.)

"A Test for Adolescents," by Eleanor D. Keller.

"Avocational Education," by W. C. Ruediger.

"The Correlation of Abilities in High School Girls," by E. F. Buchner.

"Experiments with Free Association Method," by R. M. Ogden.

W. C. RUEDIGER,
Secretary

SOCIETIES AND ACADEMIES

THE ANTHROPOLOGICAL SOCIETY OF WASHINGTON

A SPECIAL meeting of the Anthropological Society of Washington was held at 4:30 P.M., December 9, 1913, in Room 43 of the new museum building, the president, Mr. Stetson in the chair. About fifty persons were present.

Dr. Charles B. Davenport, of the Carnegie Institution, director of the laboratory at Cold Spring Harbor, Long Island, addressed the society on "Man from the Standpoint of Modern Genetics." He said that the problem of the origin of species has now become largely reduced to the problem of the origin and survival of the characters of the species. Since groups differentiated by a single hereditary character are called biotypes, the question of the origin of species is now that of the origin of biotypes. Man is a congeries of biotypes. If these do not exist as distinct elementary species it is because of the tremendous hybridization that is taking place between biotypes. These biotypes are most nearly realized in islands, peninsulas and out-of-the-way places. The most distinct of the human races exist to-day in such places as Australia and Ceylon, the Japan Islands (Ainos), Cape Horn and inside of the Arctic circle within the old and new world. But in small islands of the coast, where people have been long settled and little disturbed, they tend to approach a pure race or biotype.

Under the shelter of this isolation, incidentally, opportunity has been afforded for an adjusted race to spring up; but there is danger of deterioration through too close interbreeding. Hybridization, as stated, is constantly preventing the com-

plete development of these biotypes. This hybridization has gone on with man since early times so that few biotypes are now actually realized. It is now going on faster than ever and even the rare fairly pure biotypes are fast disappearing from the globe. The work of the anthropologist of the future must be largely with these hybridized biotypes; his principal study will be the inheritance of the various differential traits.

The method of inheritance of some of these traits has already been studied. Thus we know that the brown iris is dominant over its absence, as seen in blue eyes. The skin color of the negro is complex, being due to two double (or four) factors; and these may work independently of one another, so that we have one, two, three or four pigment factors in the skin, producing the typical quadroon, mulatto, Sambo and full negro skin coloration. Dark brown hair is dominant over blond hair; so that when both parents have only blond hair the children are all blonds. Two red-haired parents have only red-haired offspring. But two glossy black-haired parents may carry red hidden and so have red-haired children, as we so often see among the Irish. Kinky or curly hair is dominant over straight. Two straight-haired parents have, typically, only straight-haired children.

Many "hereditary diseases" depend on a "diathesis," a non-resistance that is clearly inherited and if matings of like or of relations occur extensively, we have the elements necessary for the production of a biotype. Among such diseases are Huntington's chorea, presenile cataract and night blindness. Other diseases are inherited as sex-linked characters—such are color blindness and the "bleeding" tendency. Very striking is the tendency to produce a real biotype of the imbecile class, because imbeciles tend to segregate themselves and to intermarry. This is the reason why we get such histories as the Nams of New York, the Hill Folk of Massachusetts, the Pineys of New Jersey and the Jukes of New York. Any condition that favors consanguineous matings, or matings of like, favors the formation of a variety of the human race, as Dr. Alexander Graham Bell (the Francis Galton of America) long ago pointed out. Thus most institutions which do not provide permanent custodial care tend to promote such marriages; for example, among the deaf-mutes, tubercular, nervous, paupers and even alcoholics and users of narcotics. On the other hand, in consequence of social stratification fine near-biotypes, like the Lowells of Boston, the

Dwight-Woolseys of Connecticut, the Bayard-Jay-Livingston Complex of New York, and the first families of Virginia have arisen. Actors tend to marry each other and so rapidly produce nearly pure strains of histrionic talent. This nation owes more than it recognizes to its strains of inventors, surgeons, commanders, statesmen, authors, artists and financiers that have made her famous and given her the high standing she has attained in the family of nations.

Thus biotypes in man prove to be real things and their study is quite as much within the proper field of research of the anthropologist as are the commonly recognized races of men.

The paper was discussed by Dr. Hrdlicka.

DANIEL FOLKMAR,
Secretary

THE ENTOMOLOGICAL SOCIETY OF WASHINGTON

AT the 223d regular meeting of the society, held January 7, Mr. August Busck gave his retiring presidential address entitled, "Notes on the Classification of the Microlepidoptera." In this address Mr. Busck reviewed the characters which have been used in classifying the Microlepidoptera, telling how the venation is now used most extensively and emphasizing this as the most important character in judging the phylogenetic relationships of superfamilies, families and genera. He presented his views on the phylogeny of the Microlepidoptera arranged graphically in a phylogenetic tree. This address, as well as some of the discussion which it called forth, will be published in an early number of the *Proceedings of the Entomological Society of Washington*.

The meeting was very well attended by members and visitors. The most distinguished visitor was the Canadian entomologist, Dr. C. Gordon Hewitt.

THE PHILOSOPHICAL SOCIETY, UNIVERSITY OF VIRGINIA, MATHEMATICAL AND SCIENTIFIC

SECTION

THE fourth meeting of the year 1913-14 was held January 20, 1914.

Professor T. L. Watson and Mr. J. H. Cline presented a paper entitled "Some Examples of the Intercision Type of Stream Piracy in Western Virginia."

Professor W. A. Kepner and Mr. W. H. Taliaferro presented a paper entitled "The Organs of Special Sense of *Prothyncus*."

L. G. HOXTON,
Secretary

THE SCIENCE CLUB OF THE UNIVERSITY OF WISCONSIN

DR. FREDERIC E. WRIGHT, petrologist of the Geophysical Laboratory of the Carnegie Institution of Washington, gave an account of "Some Phases of the Work of the Geophysical Laboratory" before the Science Club of the University of Wisconsin at its 127th meeting on December 10, 1913.

The scope of the Geophysical Laboratory of Washington is restricted to the field of experimental geology, and particularly to the quantitative investigation of the chemical, physical and physico-chemical phenomena of minerals. Artificial minerals are prepared from pure substances under known conditions, and are studied and compared with natural minerals. A great deal of preliminary work has been done by the laboratory in devising, making and standardizing apparatus.

Dr. Wright described and illustrated with color photographs projected on the screen the laboratory, its equipment and methods of work; performed experiments showing phenomena of crystallization, eutectic fusion, recalescence and other inversion phenomena; and showed by means of projected color photographs the polarization, and other, phenomena employed in the microscopic analysis of minerals. Dr. Wright exhibited a model of a fusion-equilibrium surface in trilinear coordinates representing the properties of all possible mixtures of lime, magnesia and silica, the result of six years' research in the laboratory. He also gave an account of the work of Dr. Day and Dr. Shepherd, in collecting and examining volcanic gases, and projected on the screen color photographs taken during the descent into the crater of Kilauea, showing in the most vivid way the phenomena of an active volcano at close range. The work of the expeditions to Kilauea has shown that water is present in the magma of volcanoes, at least of Kilauea; that this water is not of atmospheric origin, since no argon accompanies it; and that the heat of recombination of the dissociated gases is sufficient to keep the lava molten.

In response to a question by Dr. C. K. Leith, Dr. Wright gave a brief account of the present state of his research on the internal forces of crystals by determining the changes of form and other properties of crystals in response to change of temperature and pressure.

ERIC R. MILLER,
Secretary